



CLEMSON
UNIVERSITY
CENTENNIAL
1889-1989

Clemson University Undergraduate
ANNOUNCEMENTS



1989-1990

Thanks to the Special Collections Department of the Cooper Library for pictures.

The requirements for each curriculum shall be the catalog requirements in effect on the date of enrollment in that curriculum. If a student withdraws from the University and subsequently returns, the catalog requirements in effect at the time of return will control. Any variations in curricular requirements shall be considered under the substitution procedures. If all work toward a degree is not completed within six years after entrance, the student may be required to take additional courses.

Statements set forth in this catalog are for information purposes only and should not be construed as the basis of a contract between a student and Clemson University.



Clemson University

Undergraduate Announcements

1989-90



Clemson College 1921

Contents

General Information, 11
Scholastic Regulations, 39
Degrees and Curricula, 49
College of Agricultural Sciences, 54
College of Architecture, 81
College of Commerce and Industry, 88
College of Education, 101
College of Engineering, 117
College of Forest and Recreation Resources, 129
College of Nursing, 145
College of Sciences, 147
Description of Courses, 169
Index, 327

Academic Calendar

FALL SEMESTER 1988

<i>August 15, M</i>	Orientation
<i>August 16, Tu</i>	Registration
<i>August 17, W</i>	Late registration
<i>August 18, Th</i>	Classes begin; late registration fee
<i>August 24, W</i>	Last day to register or add a class
<i>September 7, W</i>	Last day to order diploma for graduation
<i>September 14, W</i>	Last day to withdraw from class or the University without record
<i>October 10, M</i>	Preliminary grades due
<i>October 24, M</i>	Last day to withdraw from class or the University without final grades
<i>October 26-</i>	
<i>November 4, M-F</i>	Preregistration
<i>November 7-8, M-Tu</i>	Fall break
<i>November 24-25, Th-F</i>	Thanksgiving holiday
<i>December 5-10, M-S</i>	Examinations
<i>December 14, W</i>	Last day to preregister for spring
<i>December 15, Th</i>	Graduation

SPRING SEMESTER 1989

<i>January 9, M</i>	Registration; orientation
<i>January 10, Tu</i>	Late registration
<i>January 11, W</i>	Classes begin; late registration fee
<i>January 17, Tu</i>	Last day to register or add a class
<i>January 31, Tu</i>	Last day to order diploma for commencement
<i>February 7, Tu</i>	Last day to withdraw from class or the University without record
<i>March 6, M</i>	Preliminary grades due
<i>March 17, F</i>	Last day to withdraw from class or the University without final grades
<i>March 20-24, M-F</i>	Spring break
<i>April 3-7, M-F</i>	Preregistration
<i>April 8, S</i>	Honors and Awards Day
<i>May 1-6, M-S</i>	Examinations
<i>May 12, F</i>	Commencement

FIRST SUMMER SESSION 1989

<i>May 22, M</i>	Registration
<i>May 23, Tu</i>	Classes begin; late registration fee
<i>May 24, W</i>	Last day to register or add a class
<i>May 30, Tu</i>	Last day to withdraw from class or the University without record
<i>June 12, M</i>	Last day to order diploma for graduation
<i>June 15, Th</i>	Last day to withdraw from class or the University without final grades
<i>June 27, Tu</i>	Examinations

SECOND SUMMER SESSION 1989

<i>July 4, Tu</i>	Holiday
<i>July 5, W</i>	Orientation
<i>July 6, Th</i>	Registration
<i>July 7, F</i>	Classes begin; late registration fee
<i>July 8, S</i>	Classes meet
<i>July 10, M</i>	Last day to register or add a class
<i>July 13, Th</i>	Last day to withdraw from class or the University without record
<i>July 15, S</i>	Classes meet
<i>July 28, F</i>	Last day to withdraw from class or the University without final grades
<i>August 4, F</i>	Last day to preregister for fall
<i>August 9, W</i>	Examinations
<i>August 12, S</i>	Graduation

FALL SEMESTER 1989

<i>August 21, M</i>	Orientation
<i>August 22, Tu</i>	Registration
<i>August 23, W</i>	Late registration
<i>August 24, Th</i>	Classes begin; late registration fee
<i>August 30, W</i>	Last day to register or add a class
<i>September 13, W</i>	Last day to order diploma for graduation
<i>September 20, W</i>	Last day to withdraw from class or the University without record
<i>October 16, M</i>	Preliminary grades due
<i>October 30-31, M-Tu</i>	Fall break
<i>November 1, W</i>	Last day to withdraw from class or the University without final grades
<i>November 6-10, M-F</i>	Preregistration
<i>November 23-24, Th-F</i>	Thanksgiving holiday
<i>December 11-16, M-S</i>	Examinations
<i>December 20, W</i>	Last day to preregister for spring
<i>December 21, Th</i>	Graduation

SPRING SEMESTER 1990

<i>January 8, M</i>	Registration; orientation
<i>January 9, Tu</i>	Late registration
<i>January 10, W</i>	Classes begin; late registration fee
<i>January 16, Tu</i>	Last day to register or add a class
<i>January 30, Tu</i>	Last day to order diploma for commencement
<i>February 6, Tu</i>	Last day to withdraw from class or the University without record
<i>March 5, M</i>	Preliminary grades due
<i>March 16, F</i>	Last day to withdraw from class or the University without final grades
<i>March 19-23, M-F</i>	Spring break
<i>April 2-6, M-F</i>	Preregistration
<i>April 7, S</i>	Honors and Awards Day
<i>April 30-May 5, M-S</i>	Examinations
<i>May 11, F</i>	Commencement

FIRST SUMMER SESSION 1990

<i>May 21, M</i>	Registration
<i>May 22, Tu</i>	Classes begin; late registration fee
<i>May 23, W</i>	Last day to register or add a class
<i>May 29, Tu</i>	Last day to withdraw from class or the University without record
<i>June 11, M</i>	Last day to order diploma for graduation
<i>June 14, Th</i>	Last day to withdraw from class or the University without final grades
<i>June 26, Tu</i>	Examinations

SECOND SUMMER SESSION 1990

<i>July 2, M</i>	Orientation
<i>July 3, Tu</i>	Registration
<i>July 4, W</i>	Holiday
<i>July 5, Th</i>	Classes begin; late registration fee
<i>July 6, F</i>	Last day to register or add a class
<i>July 7, S</i>	Classes meet
<i>July 11, W</i>	Last day to withdraw from class or the University without record
<i>July 27, F</i>	Last day to withdraw from class or the University without final grades
<i>August 3, F</i>	Last day to preregister for fall
<i>August 8, W</i>	Examinations
<i>August 11, S</i>	Graduation

BOARD OF TRUSTEES

Louis P. Batson, Jr., Greenville, *Chairman*
 Thomas B. McTeer, Jr., Columbia, *Vice Chairman*
 Billy L. Amick, Batesburg
 John J. Britton, Sumter
 Fletcher C. Derrick, Jr., Charleston
 William G. DesChamps, Jr., Bishopville
 Louis B. Lynn, Columbia
 Paul W. McAlister, Laurens
 Buck Mickel, Greenville
 James C. Self, Greenwood
 B. Marion Smith, Columbia
 James M. Waddell, Jr., Beaufort
 Allen P. Wood, Florence

Hugh J. Clausen, Clemson, *Secretary*
 Michael P. Hughey, Clemson, *Internal Auditor*

BOARD OF VISITORS

Bernie Baum, Myrtle Beach
 Harry S. Bell, Columbia
 W. Melvin Brown, Jr., Charleston
 Marion T. Burnside, Jr., Columbia
 John G. Chapman, Greenville
 J. Tracy Childers, Leesville
 Bennie Cunningham, Jr., Piedmont
 Gene E. DeLoach, Beaufort
 Wallace P. DesChamps, Bishopville
 William J. Durham, Anderson
 James P. Fields, Jr., Columbia
 Robert A. Galiano, Jr., Sumter
 Carlos W. Gibbons, Jr., Columbia
 Harry H. Gibson, Spartanburg
 Larry A. Jackson, Greenwood
 G. Tripp Jones, West Columbia
 William S. Jones, Spartanburg
 Robert P. Kapp, Jr., Columbia

Frank A. Landgraff, Jr., Greenville
 Barrett S. Lawrimore, Sr., Charleston
 Clayton Lowder, Jr., Oswego
 Robert T. Lyles, Columbia
 John A. McAllister, Mt. Carmel
 Silas C. McMeekin, Jr., Columbia
 Betty M. Moore, Spartanburg
 Richard C. Neugent, Greenville
 Rodney A. Peebles, Barnwell
 Albert H. Peters, Jr., Aiken
 James E. Pittman, Jr., Rossmoor, CA
 C. Evans Putman, Greenville
 Anna L. Reid, Clemson
 William F. Speights, Jr., Atlanta, GA
 Joseph D. Swann, Greenville
 Sidney B. Tate, Greenville
 John A. Wells, Columbia
 James H. Young, Jr., Columbia

PRESIDENT

A. Max Lennon, PhD, *President*

VICE PRESIDENTS

W. David Maxwell, PhD, *Provost and Vice President for Academic Affairs*
 Hugh J. Clausen, JD, *Vice President for Administration and Secretary of the Board of Trustees*
 Milton B. Wise, PhD, *Vice President/Vice Provost for Agriculture and Natural Resources*
 David R. Larson, MBA, *Vice President for Business and Finance*
 Gary A. Ransdell, EdD, *Vice President for Institutional Advancement*
 G. Jay Gogue, PhD, *Vice President for Research*
 Manning N. Lomax, BS, *Vice President for Student Affairs*

HUMAN RESOURCES

Frank Mauldin, MEd, *Assistant Vice President for Human Resources*

PUBLIC AFFAIRS

Wade A. Green, *Director of Public Affairs*

UNIVERSITY COUNSEL

Benjamin W. Anderson, JD, *University Counsel*

ACADEMIC ADMINISTRATION

William D. Maxwell, PhD, *Provost and Vice President for Academic Affairs*

Graduate School

Arnold E. Schwartz, PhD, *Vice Provost and Dean of Graduate School*

Farrell B. Brown, PhD, *Associate Dean, Graduate School*

A. DeWayne Brooks, EdD, *Assistant Dean, Graduate School*

Frankie O. Felder, EdD, *Associate Dean, International Programs and Services*

James A. Drake, PhD, *Executive Director, Greenville Higher Education Consortium*

Myra C. Marshall, MEd, *Director, Telecampus*

Dewitt B. Stone, PhD, *Coordinator, Off-Campus Courses*

Undergraduate Studies

Jerome V. Reel, Jr., PhD, *Vice Provost and Dean of Undergraduate Studies*

Joseph F. Boykin, Jr., MS, *Director, Libraries*

_____, PhD, *Director, Academic Special Projects*

John L. Stevenson, PhD, *Director, Honors Program*

LIBRARIES

Joseph F. Boykin, Jr., MS, *Director*

Richard W. Meyer, MS, *Associate Director*

Leslie E. Abrams, MSLS, *Branch Head, Architecture Library*

Deana L. Astle, MA, *Head, Technical Services Division*

Peggy H. Cover, MLS, *Head, Reference Unit*

Maureen Harris, MSLS, *Head, Public Documents Unit*

Teresa A. Jefferson, BS, *Head, Circulation Unit*

Steven D. Johnson, MLS, *Head, Monograph Acquisitions Unit*

Michael F. Kohl, MS, *Head, Special Collections Unit*

Marsha J. McCurley, MLS, *Head, Cataloging Unit*

Ronald L. Williford, BA, *Branch Head, Sirrine Library*

Lawrence R. Wood, MSLS, *Head, Serials Acquisitions Unit*

University Research

Edward W. Page III, PhD, *Acting Director, University Research*

Computing and Information Technology

Christopher J. Duckenfield, PhD, *Vice Provost, Computing and Information Technology*

George D. Alexander, MS, *Director, Administrative Programming Services*

David B. Bullard, MS, *Director, Computer Systems and Operations*

Charles C. Heck, BA, *Director, Consulting and Technical Services*

James V. Hopkins III, *Director, Marketing and Customer Support*

John M. Rusnak, MS, *Director, Information Systems Development*

Colleges

COLLEGE OF AGRICULTURAL SCIENCES

James R. Fischer, PhD, *Dean for Agricultural Research; Director, Agricultural Experiment Station*
Donald C. Coston, PhD, *Associate Dean and Director, Agricultural Experiment Station*
James R. Daniels, PhD, *Acting Dean and Director, Resident Instruction*
Byron K. Webb, PhD, *Dean and Director, Cooperative Extension Service*
J. Edwin Faris, PhD, *Director of International Programs*
Garnett L. Bradford, PhD, *Head, Department of Agricultural Economics and Rural Sociology*
Glen C. Shinn, PhD, *Head, Department of Agricultural Education*
Richard O. Hegg, PhD, *Head, Department of Agricultural Engineering*
Ralph E. Franklin, PhD, *Head, Department of Agronomy and Soils*
Charles W. Foley, PhD, *Head, Department of Animal Science*
D. Lamar Robinette, PhD, *Head, Department of Aquaculture, Fisheries, and Wildlife*
D. Dixon Lee, Jr., PhD, *Head, Department of Dairy Science*
Sidney B. Hays, PhD, *Head, Department of Entomology*
Woodie P. Williams, Jr., PhD, *Acting Head, Department of Food Science*
R. Daniel Lineberger, PhD, *Head, Department of Horticulture*
Ottie J. Dickerson, PhD, *Head, Department of Plant Pathology and Physiology*
Bruce Glick, PhD, *Head, Department of Poultry Science*

COLLEGE OF ARCHITECTURE

James F. Barker, MArch, *Dean*
Lamar H. Brown, BArch, *Associate Dean*
Gayland B. Witherspoon, MSArch, *Associate Dean*
John D. Jacques, MPhil, *Head, Department of Architectural Studies*
Roger W. Liska, MSCE, *Head, Department of Building Science*
John T. Acorn, MFA, *Head, Department of Visual Arts and History*
Jose R. Caban, MCD, *Head, Department of Planning Studies*

COLLEGE OF COMMERCE AND INDUSTRY

Ryan C. Amacher, PhD, *Dean*
Jimmy D. Sheriff, PhD, *Associate Dean*
G. Richard Thompson, PhD, *Assistant Dean*
Jerry E. Trapnell, PhD, *Director, School of Accountancy*
Michael T. Maloney, PhD, *Head, Department of Economics*
Rodney H. Mabry, PhD, *Head, Department of Finance*
Michael J. Stahl, PhD, *Head, Department of Management*
G. Richard Thompson, PhD, *Acting Head, Department of Marketing*
Ralph D. Elliott, PhD, *Associate Dean, Executive Education and Development*
David S. Taylor, *Director, Small Business Development Center*
Edward A. Vaughn, PhD, *Director, School of Textiles*

COLLEGE OF EDUCATION

Gordon W. Gray, EdD, *Dean*
Grover E. Musselwhite, MA, Col, USAF, *Head, Department of Aerospace Studies*
Robert P. Green, Jr., EdD, *Acting Head, Department of Elementary and Secondary Education*
Alfred F. Newton, EdD, *Head, Department of Industrial Education*
Brooke L. Harris, MBA, LTC, USA, *Head, Department of Military Science*
William E. West, PhD, *Director, Office of Educational Services*

COLLEGE OF ENGINEERING

J. Charles Jennett, PhD, PE, *Dean*
 William B. Barlage, Jr., PhD, *Associate Dean*
 A. Wayne Bennett, PhD, PE, *Acting Associate Dean*
 Walter E. Castro, PhD, PE, *Assistant Dean*
 Richard O. Hegg, PhD, *Head, Department of Agricultural Engineering*
 Andreas F. von Recum, PhD, *Head, Department of Bioengineering*
 Gordon Lewis, PhD, *Head, Department of Ceramic Engineering*
 Charles H. Barron, Jr., PhD, *Head, Department of Chemical Engineering*
 Russell H. Brown, PhD, PE, *Head, Department of Civil Engineering*
 John N. Gowdy, PhD, *Acting Head, Department of Electrical and Computer Engineering*
 Ronald J. Kopczyk, MS, PE, *Director, Engineering Services*
 Thomas M. Keinath, PhD, *Head, Department of Environmental Systems Engineering*
 Robert P. Davis, PhD, PE, *Head, Department of Industrial Engineering*
 Christian E. Przirembel, PhD, *Head, Department of Mechanical Engineering*
 F. Christopher Alley, PhD, PE, *Director, Continuing Engineering Education*

COLLEGE OF FOREST AND RECREATION RESOURCES

Benton H. Box, DF, *Dean*
 Robert W. McLellan, PhD, *Acting Head, Department of Parks, Recreation, and Tourism Management*
 Michael A. Taras, PhD, *Head, Department of Forestry*

COLLEGE OF LIBERAL ARTS

Robert A. Waller, PhD, *Dean*
 Ronald W. Moran, PhD, *Assistant Dean*
 George W. Koon, PhD, *Head, Department of English*
 Joseph L. Arbena, PhD, *Acting Head, Department of History*
 Judith M. Melton, PhD, *Head, Department of Languages*
 A. Richard Nichols, PhD, *Head, Department of Performing Arts*
 Charles H. Lippy, PhD, *Acting Head, Department of Philosophy and Religion*
 Charles W. Dunn, PhD, *Head, Department of Political Science*
 Eugene H. Galluscio, PhD, *Head, Department of Psychology*
 Richard F. Larson, PhD, *Head, Department of Sociology*

COLLEGE OF NURSING

Opal S. Hipps, EdD, *Dean*
 Priscilla M. Kline, EdD, *Associate Dean*
 Sara E. Barger, DPA, *Head, Department of Professional Development and Services*
 Robbie B. Hughes, EdD, *Head, Department of Instruction*
 Mary Ann Kelly, EdD, *Interim Head, Department of Research*

COLLEGE OF SCIENCES

Bobby E. Wixson, PhD, *Dean*
 Lewis M. Duncan III, PhD, *Associate Dean*
 Doris R. Helms, PhD, *Associate Dean*
 Lawrence A. Dyck, PhD, *Acting Head, Department of Biological Sciences*
 William M. Surver, PhD, *Acting Director, Biology Program*
 Darryl D. DesMarteau, PhD, *Head, Department of Chemistry*
 Albert J. Turner, Jr., PhD, *Head, Department of Computer Science*
 Carlton W. Ulbrich, PhD, *Acting Head, Department of Earth Science*
 Richard D. Ringeisen, PhD, *Head, Department of Mathematical Sciences*
 Malcolm J. B. Paynter, PhD, *Head, Department of Microbiology*
 Peter J. McNulty, PhD, *Head, Department of Physics and Astronomy*



Electrical Engineering Laboratory 1917

General Information

Clemson is a land-grant, state-supported university, fully accredited by the Southern Association of Colleges and Schools. Curricula are accredited by Accreditation Board for Engineering and Technology, American Assembly of Collegiate Schools of Business, Computing Sciences Accreditation Board, Council on Accreditations of the National Recreation and Park Association, National Architectural Accrediting Board, National Council for Accreditation of Teacher Education, National League for Nursing, and Society of American Foresters.

The sixty-seven undergraduate and eighty-seven graduate degree programs under the colleges of Agricultural Sciences, Architecture, Commerce and Industry, Education, Engineering, Forest and Recreation Resources, Liberal Arts, Nursing, Sciences, and the Graduate School form a background of training for the hundreds of occupations and professions in which Clemson graduates engage. The University is organized on a basis whereby it retains a clear entity through the interrelationships of colleges and departments, providing a well-balanced fundamental and general educational program.

The enrollment of Clemson has grown from 446 students at the opening of the University in 1893, to 14,794 for the first semester, 1988-89. Since the opening of the University, 52,834 students have been awarded the Bachelor's degree. During this same period, 426 Associate degrees, 11,684 Master's degrees, 985 Doctor of Philosophy degrees, 18 Doctor of Education degrees, and 149 Education Specialist degrees have been awarded.

ADMINISTRATIVE ORGANIZATION

The government of the University is vested in a Board of thirteen trustees, including six elected by the legislature and seven self-perpetuating members, in accord with the Clemson will. The President of the University is the chief executive and administrative officer elected by the Board of Trustees; and under the President there are eight areas of administration, each headed by a chief administrative officer responsible to the President. The organizational units under each of these officers are outlined as follows:

- I. Provost and Vice President for Academic Affairs
 - A. Undergraduate Studies
 1. Honors Programs
 2. Summer Sessions and Career Workshops
 3. University Library
 - B. Graduate School

- C. Colleges
 - 1. Agricultural Sciences
 - 2. Architecture
 - 3. Commerce and Industry
 - 4. Education
 - 5. Engineering
 - 6. Forest and Recreation Resources
 - 7. Liberal Arts
 - 8. Nursing
 - 9. Sciences
- D. Institutes
 - 1. The Belle W. Baruch Forest Science Institute
 - 2. Housing Institute
 - 3. Water Resources Research Institute
 - 4. Strom Thurmond Institute
- E. Division of Computing and Information Technology
 - 1. Computer Center
 - 2. Administrative Programming Services
 - 3. Information Systems Development
- II. Vice President for Administration and Secretary of the Board of Trustees
 - A. Human Resources
 - B. Internal Auditing
 - C. Magistrate's Office
 - D. Parking and Vehicle Registration
 - E. Public Affairs
 - F. Public Safety
- III. Vice President and Vice Provost for Agriculture and Natural Resources
 - A. Agricultural Research
 - B. Cooperative Extension Service
 - C. College of Agricultural Sciences
 - D. College of Forest and Recreation Resources
 - E. Livestock-Poultry Health
 - F. Regulatory and Public Service
- IV. Vice President for Business and Finance
 - A. Budgets and Planning
 - B. Business and Financial Affairs
 - C. Facilities Planning and Management
 - D. Financial Services
 - E. Management Services
 - F. Personnel Management and Development
- V. Vice President for Institutional Advancement
 - A. Advancement Services
 - B. Agricultural Communications
 - C. Alumni Relations
 - D. Capital Campaigns
 - E. Clemson Loyalty Fund
 - F. Constituent Communications

- G. Corporate and Foundation Relations
- H. Development Programs
- I. Donor Relations
- J. Donor Research
- K. Electronic and Photographic Services
- L. Planned Giving
- M. Publications and Graphics
- N. News Services
- O. Special Events
- P. University Relations
- Q. Visitor Programs
- VI. Vice President for Research
 - A. University Research
- VII. Vice President for Student Affairs
 - A. Admissions, Registration, and Financial Aid
 - B. Athletic Department
 - C. Bookstore
 - D. Career Services
 - E. Counseling
 - F. Housing
 - G. Intramural Sports
 - H. Littlejohn Coliseum
 - I. Student Health Services
 - J. Student Development
 - K. Student Union
- VIII. University Counsel

ADMISSIONS

Beginning Freshmen To receive consideration for admission to Clemson, candidates must submit a high school transcript through their counselor and have results of the Scholastic Aptitude Test (SAT) sent directly from the College Board in Princeton, New Jersey.

In addition, all South Carolina public senior colleges and universities now require that applicants for freshman admission complete the following courses in high school:

English Four credits are required, including at least two having strong grammar and composition components, at least one in English literature, and at least one in American literature. Completion of college preparatory English I, II, III, and IV will meet these requirements.

Social Studies Three credits are required, including one credit in U.S. History, one-half credit in economics, one-half credit in government, and one credit in an additional social studies.

Mathematics Three credits are required, including Algebra I and II. Geometry is strongly recommended as the required third unit. A fourth unit is recommended but not required.

Laboratory Science Two credits are required, including at least one unit each of two laboratory sciences chosen from biology, chemistry, or physics. A third unit of a laboratory science is strongly recommended.

Foreign Language Two credits from the same foreign language are required.

Other One credit is required in advanced mathematics or computer science or a combination of these; or in world history, world geography, or Western civilization. One credit in PE/ROTC completes the sequence of required courses.

The SAT examination scores, rank in class, academic preparation, and recommendation of the high school counselor will be weighed carefully in the decision-making process. The applicant's acceptance will be confirmed upon presentation of a final high school transcript indicating continued academic progress and graduation.

Transfer Candidates All transfer applicants must have original transcripts of their records sent to Clemson directly from each college or university attended. Unless so stated on the transcript, the candidate should present statements of honorable dismissal and of eligibility to return to the institution last attended. Generally, only candidates who have accumulated 30 semester (45 quarter) hours of work with a cumulative average of C+ will be considered for admission. SAT scores are required of some transfer students, and high school transcripts may be required in a few instances. Candidates concerned will be notified individually if either or both of these credentials are needed.

All Applicants Various nonintellective factors will be considered in cases where it is impossible to make a positive decision on the basis of SAT scores and previous academic performance alone.

Special Student Status The special student classification is designed for high school graduates or persons at least 19 years of age who have no interest in pursuing a degree. It is not a "trial admission" status or one for candidates who apply too late to submit credentials for consideration for regular admission. Applicants denied regular admission to Clemson are not eligible to apply as special students.

None of the usual credentials supporting an application are required of such applicants. A maximum of 18 undergraduate credit hours can be taken during the regular semester or summer sessions. Although it is possible to enroll in the immediately succeeding semester until the cumulative maximum of 18 credit hours is taken, students must submit a new application for each entrance period. Moreover, preregistration is prohibited, inasmuch as regular Clemson students have priority for enrollment in all courses.

Application Forms and Dates Application forms may be obtained by writing to the Office of Admissions, Clemson University, Clemson, South Carolina 29634-4024. Application forms and catalogs for all 1990 entry dates are available beginning September 1989. Preliminary application forms are available anytime for those who wish to be included in the September mailing, and freshman candidates are especially encouraged to submit preliminary applications and sit for the Scholastic Aptitude Test (SAT) during the spring semester of their junior year.

There is no established application deadline for submitting the necessary credentials. However, candidates should understand that admission

is closed when all classroom space has been committed. The majority of freshman admission decisions are reached during the period November through March. Transfer students seeking entrance in August usually are notified between February and July.

Application Fee Candidates must submit a nonrefundable fee of \$25 with their applications. This fee is not applicable toward tuition and/or other University fees.

Housing Applications Forms for requesting University housing are enclosed with applications for admission but must be returned directly to Housing, as the two applications are processed by separate offices. Upon receipt of a request, Housing Office personnel will forward further information and contracts in the order in which the requests are received. Once all facilities appear to be committed, students will be notified that their names have been added to the waiting list.

Candidates receiving housing contracts must complete and return the form with a \$95 housing deposit in accordance with the due date stated. Those returning these items who subsequently are accepted for admission are guaranteed housing. The \$95 deposit will be refunded to students who reserved housing but are denied admission to the University.

University housing is limited and cannot be guaranteed to all entering students. New freshmen have priority over transfer students for the fall semester. Housing packets are sent out on a first-come, first-served basis as the applications are received.

Entrance Examinations All freshman candidates and some transfer students must submit scores for the SAT. In most cases, students transferring from accredited colleges need not submit SAT scores if they have earned thirty or more transferable semester hours with a C+ or greater average, based on a four-point grading system. Those enrolled in technical programs at technical and community colleges usually will be required to submit SAT scores.

For August enrollment, it is recommended that students complete the SAT no later than the preceding December.

Candidates who have completed the required tests previously may have their scores reported to Clemson by directing a request to the College Board. Others may secure a *College Board Student Bulletin* and an application for the tests from their local high school or from the Board's Office, CN 6200, Princeton, New Jersey 08541-6200. *Copies of student reports and those submitted by third parties, such as high schools and colleges, are not acceptable.*

College Board Achievement Tests For academic placement, the majority of prospective freshmen are required to take at least one College Board Achievement Test: Mathematics, Level II. Although most decisions are reached without benefit of achievement test results, these scores sometime improve one's chances for admission. For applicants attending high schools that do not compute class rank, it may be helpful to take English and one other achievement test, in addition to Mathematics, Level II by January of the senior year.

Mathematics For students beginning in curricula that require MTHSC 101, 102, 106 or 119 or those majoring in Prephysical Therapy, the Col-

lege Board Mathematics Achievement Test, Level II is required. The College Board Advanced Placement (AP) examination in Calculus is the only recognized substitute. Failure to sit for one of these tests will result in placement in remedial work that will not apply toward mathematics requirements.

Language Applicants desiring advanced placement in a foreign language may take the College Board's Achievement Test, the Advanced Placement Examination, or a test administered during summer orientation by the Department of Language at Clemson. Advanced placement on the basis of an achievement test begins with a score of 450 or higher and enables a student to exempt one or more semesters, depending on the score earned. Credit will be awarded after completion of a higher-level (qualifying) course at Clemson with a grade of C or better.

Credit by Examination Students may receive college credit by completing one of the following examinations:

Advanced Placement Program The College Board Advanced Placement Program (AP) provides an opportunity for highly motivated high school students to begin their college careers during the last year or two of high school. The growth in AP has increased steadily at Clemson where more than one-third of recent freshman classes have participated in the program with approximately two-thirds of these achieving the necessary scores to receive credit for one or more courses.

AP participants take college-level courses taught in their high schools, sit for nationally administered examinations in the subjects concerned, and submit test scores to Clemson for credit. Credit is awarded to those earning scores of 3, 4, or 5 on the AP examinations.

College Board College-Level Examination Program (CLEP) This program has very limited recognition at Clemson. A few departments accept credit for CLEP subject-matter examinations; however, CLEP General Examinations are not recognized. Credit is awarded for introductory-level courses according to criteria established by the following departments: Chemistry, English (composition only), and Mathematical Sciences (algebra and trigonometry only—applicable principally in agricultural curricula permitting use of MTHSC 105). Numerical scores plus essays, required when offered as part of a CLEP examination, will be evaluated by the appropriate department. CLEP was designed primarily for adults with nontraditional learning experiences; it is not generally appropriate for freshmen.

Transfer Credit Work completed at other accredited institutions with a grade of C or higher, including appropriate exemption credit, will be evaluated for transfer in terms of equivalent courses included in the Clemson curriculum of the student's choice. This does not guarantee that all courses taken at another institution will be accepted for transfer and use in Clemson curricula. The acceptability of each course and exemption will be based on an evaluation by the faculty concerned and will be managed by the admissions staff.

Students transferring may select the curriculum that was outlined in the *Clemson University Announcements* at the time they entered the sending institution, provided that they have been in continuous enroll-

ment. Further, transfer students may select any curriculum adopted subsequent to that initial curriculum. After enrolling at Clemson, if transfer students change from one major to another, they will complete all of the requirements included in the new curriculum that are in effect at the time of the change. Transfer students who take more than five years from the date of initial enrollment at the sending institution to graduate may be required to take additional coursework.

Campus Visits and Tours The University Visitors Center, located in Tillman Hall, is open Monday through Friday from 8:00 a.m. to 5:30 p.m.; Saturday from 10:00 a.m. to 4:00 p.m.; and Sunday from 2:00 p.m. to 5:30 p.m. The Center is closed on selected holidays.

Guided walking tours are available from the Visitors Center on Monday through Saturday at 10:00 a.m. and 2:00 p.m. and Sunday at 2:00 p.m. (When classes are not in session, only one guided tour will be given—Monday through Friday at 2:00 p.m.) Thirty-five minute cassette self-guided tours are also available. For additional information, call (803) 656-4789.

Prospective students are also welcome to visit and talk with staff, faculty, and students of the University. Visits can be made to the Admissions Office without an appointment during regular office hours Monday through Friday, 8:00 a.m. to 4:30 p.m. It is best to avoid visiting the campus during the last two weeks of August and the first week of January, as these are class registration periods. The staff and faculty cannot always assist visitors at these times.

Candidates for the College of Architecture are particularly encouraged to come for an interview. Prospective students will have an opportunity to discuss the programs offered with a faculty member and tour the facilities. Appointments should be made in advance by contacting that College.

Interviews are not required in considering candidates, nor will the results of interviews affect admissions decisions. Rather, the purpose is to provide candidates the opportunity to learn more about the University.

Orientation Program The University has scheduled a series of two-day orientation programs during the summer months for entering freshmen, transfer students, and their parents. All accepted students are expected to attend one of these sessions.

During orientation students will have an opportunity to discuss their educational objectives with an adviser, to preregister for the fall semester, and to learn about student life. Transfer students have their transcripts evaluated and select appropriate courses for their first semester at Clemson. Those transferring may find it difficult to schedule the appropriate courses if they fail to attend one of the first six orientation periods. The dates for orientation in 1989 are as follows:

June 22, 23	July 13, 14
June 26, 27	July 17, 18 ¹
June 29, 30	July 20, 21 ¹
July 5, 6 ¹	August 20, 21 ²

¹Good choice for transfer students as well as freshmen

²The program on this date is abbreviated, and it is especially inappropriate for transfer students. Only foreign students and American students living great distances from the University should defer orientation until this time

International Students A limited number of well-qualified students from other countries are accepted. The student should file an application and take the College Board's Scholastic Aptitude Test (SAT) and Test of English as a Foreign Language (TOEFL). Complete transcripts of secondary and college-level academic work also must be submitted.

ADMISSION OF POST-BACCALAUREATE STUDENTS

A student may be accepted by the Graduate School as a post-baccalaureate student if he/she applies to a specific graduate degree program but does not have the appropriate academic background. Such a student must be recommended by the appropriate department or program chairperson and must fully meet all other requirements for admission to the particular degree program with respect to grade-point ratio and standardized test scores. A student in this category who is denied admission because of failure to meet the minimum requirements has access to the same appeal procedures as does any other student applying to the Graduate School.

Applicants will be classified as post-baccalaureate students if they are not qualified to take at least one graduate course per semester which can be included in the minimum hours required for the graduate degree. Additionally, any student required to complete more than eighteen semester hours of undergraduate credits will be classified as post-baccalaureate. Until such time that the required number of undergraduate credit hours is less than or equal to eighteen and the student is qualified to take, each semester, a graduate course which can be included in the minimum hours required for the graduate degree, he or she will remain classified as post-baccalaureate. A department or a student may request post-baccalaureate status even though the above criteria are satisfied.

At the time a post-baccalaureate student becomes eligible for classification as a graduate student, the decision as to eventual admission status (full or provisional) will be made according to criteria utilized by the department and Graduate School for all other applicants to the particular degree program. The post-baccalaureate student is expected to maintain a B average and receive no grade lower than C in order to qualify for admission to a graduate program.

Post-baccalaureate students may enroll in the same number of credits per semester as any undergraduate student but shall not enroll in graduate courses or receive a graduate assistantship. No degree or certificate shall be awarded to students in a post-baccalaureate status and such students who subsequently desire to obtain an additional baccalaureate degree must apply through the Office of Admissions and Registration. The applicability of credits earned toward the undergraduate degree will be determined by the policy pertaining to transfer students. Tuition and fees for post-baccalaureate students shall be those applicable to undergraduates with the exception of the application fee and admissions deposit.

A student possessing an undergraduate degree or a graduate degree and who wishes to enroll in specific undergraduate courses for reasons other than future admission to the Graduate School shall not be classified as post-baccalaureate and shall be governed by policies established by the Office of Admissions and Registration.

READMISSION OF FORMER UNDERGRADUATE STUDENTS

Students who previously have attended Clemson and who wish to return must secure an application for reentrance from the Registrar's Office. Students who have attended another institution while away must submit an official transcript from that institution. Readmission to the program in which the student was previously enrolled is not always automatic. An interview may be requested by the department.

GRADUATE STUDY

Programs leading to graduate degrees from Clemson University are available in nine colleges—Agricultural Sciences, Architecture, Commerce and Industry, Education, Engineering, Forest and Recreation Resources, Liberal Arts, Nursing, and Sciences.

For information concerning advanced degrees see *The Graduate School Announcements* which may be obtained from the University Graduate School.

EXPENSES

Establishment of University Fees The annual State Appropriation Act imposes the general requirement that student fees be fixed by the University Board of Trustees. The Act imposes two specific requirements on the Board: (1) In fixing fees applicable to academic and general maintenance and operation costs, the Board must maintain a minimum student fee not less than the fee charged the previous year. (2) In fixing fees applicable to dormitory rental, dining halls, laundry, infirmary, and all other personal subsistence expenses, the Board must charge students an amount sufficient to fully cover the cost of providing such facilities and services.

Settlement of University Fees The Schedule of Semester Charges for all undergraduate students—full or part time, and auditing—is shown on the pages which follow. Satisfactory settlement of all expenses is a requirement for completing each semester's class registration, and no student is officially enrolled until all past due accounts have been satisfied.

In special cases the University will accept, at the beginning of a semester, a noninterest-bearing promissory note for a portion of the semester residence-hall rent and semester-plan board fee. Amounts up to \$275 for room rent, \$300 for 5- or 7-day board fee, and \$160 for the lunch plan only may be included in the note. In such cases, a note for the fall semester charges will be due October 1, and for the spring semester, March 1. Failure to pay the note when due will result in the denial of future deferred payment note privileges and termination of board plan and/or cancellation of housing contract.

A \$95 advance payment of room rent is required for a room reservation for the fall semester. Currently enrolled students who expect to continue enrollment are given an opportunity to make room reservations and pay the \$95 during the spring semester at a time designated by the Housing Office. New students who are offered on-campus housing accommodations are to pay a \$95 advance payment of room rent and \$100 admissions deposit. The \$95 advance payment of room rent and

the \$100 admissions deposit are deducted from the amount otherwise due for the first semester expenses.

All checks and money orders should be made payable to Clemson University. Any check given in payment of University expenses which is returned unpaid by the bank immediately creates an indebtedness by the student to the University.

Returned Checks A personal check given in payment of University expenses that is returned unpaid by the bank immediately creates an indebtedness to the University. The Office of Financial Management, Collections Office, G-13 Sikes Hall, administers matters related to the collection of all returned checks for students and nonstudents. Prior to turning over returned checks for academic fees, the Bursar's Office will redeposit these checks one time. A \$10 returned check charge will be assessed for each returned check in accordance with State laws. Students with returned checks for payment of academic fees are also subject to a late payment fee of \$5 per calendar day, not to exceed \$350, beginning the day after the last day of registration.

Any individual who cashes a two-party check or uses a two-party check for payment of University expenses will be held responsible for that check if it is returned unpaid by the bank. Checks used as payment for various University services, such as meal plans, housing, and others, that are later returned unpaid by the bank give the University the right to cancel such services and cause forfeiture of any refund.

Individuals will be notified by certified letter regarding returned checks and will be given 15 days from the date the letter was mailed, as required by State law, to make payment of the returned check plus the returned check charge. Payment for unpaid returned checks must be made by cash, certified check, cashier's check, or money order.

Failure to respond within 15 days for returned checks other than academic fees will result in a fraudulent check report being made to the University Police Department. Upon verification that the report is founded and that all administrative procedures were followed, the University Police Department will investigate the report as provided by State law.

Failure to make payment within the 70-day late payment period for returned checks in payment of academic fees will result in the cancellation of the student's enrollment. The student's enrollment may not be reinstated for the current semester or term but the student may enroll for a future semester or term by satisfying any indebtedness owed prior to registration. The University may restrict subsequent payment for tuition and fees by accepting cash, certified checks, cashier's checks, or money orders.

Any returned check not collected by the above procedures may be turned over to a collection agency and the indebtedness reported to a credit bureau. Transcripts and diplomas will be withheld pending payment.

Abuse of check-cashing and check-payment privileges may result in restriction of such privileges for an indefinite period of time based on the frequency and/or dollar amount, as determined by the Collections Office.

Schedule of Semester Charges

Actual charges for 1989-90 are not known when the catalog is printed. The charges reflected below are for 1988-89 and are subject to change as conditions warrant.

	<i>Resident</i>	<i>Nonresident</i>
Full-time academic fee	\$1,030.00	\$2,835.00
Part-time academic fee (per semester hour)	\$ 80.00	\$ 214.00
Auditing academic fee (per semester hour)	\$ 40.00	\$ 107.00
Staff academic fee (per semester hour)		\$ 40.00
Graduate assistant academic fee		\$ 300.00
Laboratory Fee (per laboratory); nonrefundable after last day to add		\$ 10.00
Medical fee (Must be paid by full-time students and/or students in University housing.)		\$ 80.00
University Housing		
Johnstone Hall (except Annexes A and F)		\$ 545.00
Benet, Bowen, Bradley, Cope, Donaldson, Geer, Johnstone (Annexes A, F), Norris, Sanders, Wannamaker, Young		\$ 590.00
Barnett, Byrnes, Lever, Manning, Mauldin, Smith		\$ 650.00
Clemson House (room)		\$ 660.00
Clemson House (kitchenette)		\$ 690.00
Thornhill Village (four occupants)		\$ 725.00
Calhoun Courts Apartments (four occupants)		\$ 830.00
Temporary Housing		\$ 430.00
Board		
Seven-Day Plan (21 meals), Monday-Sunday		\$ 700.00
Five-Day Plan (15 meals), Monday-Friday		\$ 600.00
Lunch Plan (5 meals), Monday-Friday		\$ 320.00

Full-time Status Undergraduate and graduate students must be enrolled in 12 semester hours to have full-time status. Students enrolled for less than 12 hours or who drop below 12 hours may become ineligible for some student services, financial aid, or other beneficial programs.

Part-time Status Undergraduate and graduate students taking less than 12 semester credit hours will be charged each semester according to the above schedule. These fees do not provide for admission to athletic events, concert series, and other such activities.

Past Due Accounts Any indebtedness to the University which becomes past due immediately jeopardizes the student's enrollment, and no such student will be permitted to reenroll for an ensuing semester or summer school term. Further, any student who fails to pay all indebtedness to the University may not be issued a transcript or diploma.

Refund of Academic Fees (Tuition, University Fee, and Medical Fee) for Students Withdrawing, Dropping to Part time, or Part-time Students Dropping Credit Hours No refunds will be made on a semester's tuition and fees after four weeks from the last day to register. In the case of a withdrawal from the university, refunds will be based on the date the

Schedule Change Form is returned to the Registrar's Office. To be eligible for a refund, the student's request must be received by the Office of Financial Management prior to the beginning of the next fall/spring semester. Beginning with the day following the last day to register, refunds for periods of four weeks or less during a semester shall be made on the following basis:

<i>Period of Enrollment After the Last Day to Register</i>	<i>Percent Refunded</i>
One week or less	80%
More than 1 but not more than 2 weeks	60%
More than 2 but not more than 3 weeks	40%
More than 3 but not more than 4 weeks	20%
More than 4 weeks	0%

Refund of Dining Hall and Residence Hall Fees Specific information relating to living-expense refunds is given in the sections on Housing and Student Food Service.

Refunds of Financial Aid for Students Withdrawing from the University Refunds for academic fees will be made in accordance with the semester and summer session refund policies. University housing refunds will be made in accordance with the housing contract.

Refunds for meal plans will be made on pro rata basis.

Since Financial Aid is expected to meet or help meet educational costs, any academic fee, housing, or meal-plan fee for students withdrawing from the University, up to the amount of financial aid received for that semester or summer session, will be refunded to the Financial Aid Program(s) from which the student received assistance.

To determine the amount of refund that will be returned to Federal Title IV Aid Programs and what amount will be returned to the non-Title IV Aid Programs, the following formula will be used:

$$\text{Federal Title IV Refund} = \frac{(\text{Amount of Refund}) \times \text{Title IV Aid Received}}{\text{Total Aid Received}}$$

$$\text{Non-Title IV Refund} = \text{Amount of Refund minus Title IV Refund}$$

In refunding monies to the various Financial Aid Programs, the following priority listings will be used.

- A. Title IV Programs
 1. National Direct Student Loan Program (NDSL)
 2. Supplemental Educational Opportunity Grant (SEOG)
 3. Guaranteed Student Loans (GSL)/Plus Loans
 4. Pell Grant
- B. Non-Title IV Programs
 1. Institutional Loans
 2. Institutional Scholarships and/or Grants
 3. Private Loans/Scholarships

After the refund has been applied to Title IV and non-Title IV programs, any refund balance will be refunded to the student.

If debts were incurred before withdrawing, such as bad checks, unpaid traffic fines, library fines, and others, the refund will cover these obligations first.

Academic fees, housing, and meal-plan refunds for students not withdrawing will be paid to the student.

Late Registration Service Charge Registration for classes is scheduled for specific days, and certain definite procedures are outlined to prevent or reduce the problems incident to late registration. A student has not completed registration until all required steps have been taken, the final being the return of the registration form, and if not preregistered for classes the properly signed class registration card to the Office of Admissions and Registration. Any student failing to complete registration on the specified class registration days will incur a service charge.

Books and Supplies The cost of books is not included in the Schedule of Semester Charges. Books and supplies at the beginning of the semester will be approximately \$125-\$200.

Transcripts Official transcripts may be obtained from the Transcripts/Registrar's Office at \$3.00 each. Students with past due indebtedness to the University or who are under disciplinary sanctions may not be issued transcripts. Transcripts requested in person are normally available for pickup during the next business day. Allow one week to ten days for delivery of mail requests.

RESIDENT TUITION AND FEES

Entitlement— Eligibility for payment of in-state tuition and fees shall be determined under the provisions of Sections 59-112-10 through 59-112-100, South Carolina Code of Laws, 1976, as amended. This law is set forth in its entirety as follows (subject to further amendment by the General Assembly).

Definitions— Section 59-112-10. As used in this chapter:

A. The words "State Institution" shall mean those post-secondary educational institutions under the jurisdiction of the following: (1) Board of Trustees, Clemson University; (2) Board of Trustees, Medical University of South Carolina; (3) Board of Trustees, South Carolina State College; (4) State College Board of Trustees; (5) Board of Visitors, The Citadel; (6) Board of Trustees, University of South Carolina; (7) Board of Trustees, Winthrop College; and (8) State Board of Technical and Comprehensive Education.

B. The word "student" shall mean any person enrolled for studies in any State institution.

C. The word "residence" or "reside" shall mean continuous and permanent physical presence within this State, *provided*, that temporary absences for short periods of time shall not affect the establishment of a residence.

D. The word "domicile" shall mean a person's true, fixed, principal residence and place of habitation; it shall indicate the place where such person intends to remain, and to which such person expects to return upon leaving without establishing a new domicile in another state. For purposes of this section one may have only one legal domicile; one is presumed to abandon automatically an old domicile upon establishing a new one. Housing provided on an academic session basis for students at State Institutions shall be presumed not to be a place of principal residence, as residency in such housing is by nature temporary.

E. The words "in-state rates" shall mean charges for tuition and fees established by State Institutions for persons who are domiciled in South Carolina in accordance with this act; the words "out-of-state rates" shall

mean charges for tuition and fees established by State Institutions for persons who are not domiciled in South Carolina in accordance with this act.

F. The words “independent person” shall mean a person in his majority, or an emancipated minor, whose predominant source of income is his own earnings or income from employment, investments, or payments from trusts, grants, scholarships, loan, or payments of alimony or separate maintenance made pursuant to court order.

G. The words ‘dependent’ or ‘dependent person’ mean:

(1) one whose financial support is provided not through his own earnings or entitlements, but whose predominant source of income or support is payments from a parent, spouse, or guardian, and who qualifies as a dependent or an exemption on the federal tax return of the parent, spouse, or guardian; or

(2) one for whom payments are made, under court order, for child support and the cost of his college education by an independent person meeting the provisions of Section 59-112-20 A or B.

However, the words ‘dependent’ or ‘dependent person’ do not include a spouse or former spouse who is the recipient of alimony or separate maintenance payments made pursuant to court order.

H. The word “minor” shall mean a person who has not attained the age of eighteen years; and the words “emancipated minor” shall mean a minor whose parents have entirely surrendered the right to the care, custody and earnings of such minor and are no longer under any legal obligation to support or maintain such minor.

I. The word “parent” shall mean a person’s natural or adoptive father or mother; or if one parent has custody of the child, the parent having custody; or if there is a guardian or other legal custodian of such person, then such guardian or legal custodian; *provided*; however, that where circumstances indicate that such guardianship or custodianship was created primarily for the purpose of conferring South Carolina domicile for tuition and fee purposes on such child or dependent person, it shall not be given such effect.

J. The word “spouse” shall mean the husband or wife of a married person.

South Carolina Domicile Defined for Purposes of Rates of Tuition and Fees— Section 59-112-20. South Carolina Domicile for tuition and fee purposes shall be established as follows in determinations of rates of tuition and fees to be paid by students entering or attending State Institutions:

A. Independent persons who reside in and have been domiciled in South Carolina for a period of no less than twelve months with an intention of making a permanent home herein, and their dependents, may be considered eligible for in-state rates.

B. Independent persons who reside in and have been domiciled in South Carolina for fewer than twelve months but who have full-time employment in the State, and their dependents, may be considered eligible for in-state rates for as long as such independent person is employed on a full-time basis in the State.

C. Where an independent person meeting the provisions of Section 2 B above, is living apart from his spouse, or where such person and his

spouse are separated or divorced, the spouse and dependents of such independent person shall have domiciliary status for tuition and fee purposes only under the following circumstances:

(1) if the spouse requesting domiciliary status for tuition and fee purposes remains domiciled in South Carolina although living apart or separated from his or her employed spouse.

(2) if the dependent requesting domiciliary status for tuition and fee purposes is under the legal custody or guardianship, as defined in Section 1 I above, of an independent person who is domiciled in this State; or if such dependent is claimed as an income tax exemption by the parent not having legal custody but paying child-support, so long as either parent remains domiciled in South Carolina.

D. The residence and domicile of a dependent minor shall be presumed to be that of the parent of such dependent minor.

Effect of Change of Residency— Section 59-112-30. When the domicile of a student or of the person upon whom a student is financially dependent changes after enrollment at a State Institution, tuition charges shall be adjusted as follows:

A. Except as provided in Section 2 B above, when domicile is taken in South Carolina, a student shall not become eligible for in-state rates until the beginning of the next academic session after expiration of twelve months from date of domicile in this State.

B. When South Carolina domicile is lost, eligibility for in-state rates shall end on the last day of the academic session in which the loss occurs; however, application of this subsection shall be at the discretion of the institution involved.

C. Notwithstanding the other provisions of this section, any dependent person who has been domiciled with his family in South Carolina for a period of not less than three years immediately prior to his enrollment may enroll in a state-supported institution of higher learning at the in-state rate and may continue to be enrolled at such rate even if the parent, spouse, or guardian upon whom he is dependent moves his domicile from this State.

Effect of Marriage— Section 59-112-40. Except as provided in Section 2 above, marriage shall affect determinations of domicile for tuition and fee purposes only insofar as it operates to evince an intention by the parties to make a permanent home in South Carolina.

Military Personnel and Their Dependents— Section 59-112-50. Notwithstanding other provisions of this act, during the period of their assignment to duty in South Carolina members of the armed services of the United States stationed in South Carolina and their dependents may be considered eligible for in-state rates. When such armed service personnel are ordered away from the State, their dependents may continue for an additional twelve months to have this eligibility at the State Institutions where they are enrolled at the time such assignment ends. Such persons and their dependents may be considered eligible for in-state rates for a period of twelve months after their discharge from the armed services even though they were not enrolled at a State Institution at the time of their discharge, if they have evinced an intent to establish domicile in South Carolina and if they have resided in South Carolina for a period of at least twelve months immediately preceding their discharge.

Faculty, Administrative Employees and Dependents Thereof— Section 59-112-60. Full-time faculty and administrative employees of State Institutions, and the spouses and children of such persons, shall be excluded from the provision of this act.

Abatement of Rates for Nonresidents on Scholarship— Section 59-112-70. Notwithstanding other provisions of this act, the governing boards listed in Section 1 A above, are authorized to adopt policies for the abatement of any part or all of the out-of-state rates for students who are recipients of scholarship aid.

Administration of Chapter; Burden of Proving Eligibility on Students— Section 59-112-80. Each State Institution shall designate an official to administer the provisions of this act. Students making application to pay tuition and fees at in-state rates shall have the burden of proving to the satisfaction of the aforesaid officials of State Institutions that they have fulfilled the requirements of this act before they shall be permitted to pay tuition and fees at such rate.

Penalties for Willful Misrepresentations— Section 59-112-90. Where it appears to the satisfaction of officials charged with administration of these provisions that a person has gained domiciliary status improperly by making or presenting willful misrepresentations of fact, such persons shall be charged tuition and fees past due and unpaid at the out-of-state rate, plus interest at a rate of eight percent per annum, plus a penalty amounting to twenty-five percent of the out-of-state rate for one semester; and until these charges have been paid no such student shall be allowed to receive transcripts or graduate from any State Institution.

Regulations— Section 59-112-110. The Commission on Higher Education may prescribe uniform regulations for application of the provisions of this act and may provide for annual review of such regulations.

EDUCATIONAL BENEFITS FOR VETERANS AND WAR ORPHANS

The Veterans Administration provides educational assistance for veterans and children of deceased or totally disabled veterans who meet requirements of applicable laws and regulations. Any veteran or child of a deceased or totally disabled veteran should communicate with the nearest Veterans Administration Office to determine whether or not he is entitled to any educational benefits.

CLEMSON UNIVERSITY FOUNDATION

The Clemson University Foundation is a nonprofit organization which solicits, manages, and administers gifts made from private sources to the academic programs at Clemson University.

Originally chartered in 1933, it was restructured in 1987 to more effectively serve the overall Institutional Advancement program at the University.

There are 29 voting members of the Board of Directors who oversee the Foundation's activities. At least 16 of the 24 elected directors are alumni of the University. Other voting directors include a member of the University Board of Trustees appointed by its Chairman, the president and vice president of the Clemson University Alumni Association and

the president and the vice president of IPTAY. The president of Clemson University, the vice president for Institutional Advancement, the vice president for Business and Finance, and the associate vice presidents for Development and Advancement Services serve as ex-officio directors. The vice president for Institutional Advancement serves as the executive officer for the Foundation.

The Foundation operates with a heavy emphasis on an effective committee structure that reports through an executive committee to the full board. An administrative division—the Administrative Council—includes committees that direct their attention to real estate, investments, policy and bylaws and nominations. A fund-raising division—the Development Council—oversees committees responsible for the Clemson Loyalty Fund; deferred gifts; club-level giving; corporate and foundation solicitation; and school, college, and unit fund-raising activity. Working directly with the executive committee is an executive committee for the Campaign for Clemson.

Market value of the assets of the foundation as of June 1988 was approximately \$30 million.

CLEMSON ALUMNI ASSOCIATION

The Clemson Alumni Association has been recognized on numerous occasions over its history as one of the top such organizations in the country.

The Association stresses service to its 55,000-plus alumni and to a student body of 14,500. Regular programs designed to strengthen the high loyalty and great interest that alumni have in their Alma Mater are conducted both on and off campus. Some 65 Clemson Clubs are located throughout the United States, and Clemson graduates are located in every state and most foreign countries throughout the world. Reunions, student alumni programs, and continuing education programs also form the basis for a varied array of services to benefit Clemson and Clemson alumni.

All functions and services of the National Clemson Alumni Association are coordinated out of offices located in the Clemson Alumni Center, a campus centerpiece that was built, furnished, and equipped entirely by gifts from alumni, especially for that purpose. Accurate records of addresses, employment, and biographical information are kept on alumni of the Institution as well as on thousands of former students who express a desire to be involved with the University and its alumni program.

A regular publication program keeps active alumni, friends, and parents aware of what Clemson is doing through its outstanding programs in teaching, research, and public service. *The Clemson World* magazine is published quarterly and the *Clemson World News* tabloid is also published quarterly.

Traditional programs such as the Alumni Professorships, the R. F. Poole, Frank Jervey, and Alumni Presidential Scholars programs; and awards for distinguished teaching, outstanding research, and high public service are recognized as the most prestigious of their kind on campus. Alumni are continually involved in developing new sources of enhancement for the educational programs of the University.

RESERVE OFFICERS TRAINING CORPS

The Departments of the Army and the Air Force both maintain ROTC units at Clemson University. Their mission is to produce officers of high quality to pursue both technical and nontechnical careers in the U.S. Army and Air Force. Both two- and four-year programs are available. The four-year program consists of the basic course for freshmen and sophomores and the advanced course for juniors and seniors.

Scholarships are available to selected ROTC students. Each scholarship pays for tuition, books, and laboratory expenses, in addition to \$100 per month during the school year. Nonscholarship advanced cadets also receive \$100 per month. Basic course credit may be awarded to students having one or more years of military service.

Selected advanced Air Force cadets receive flight training at government expense.

Cadets who complete the Advanced or Professional Course and satisfy commissioning requirements as established by law and/or regulations are appointed Second Lieutenants. Ample opportunity exists for graduate study in both services, with temporary deferments possible.

HISTORY

It was the fall of the year and likely one of those blustery days as the horse-drawn carriage slowly rolled to a stop on a Pendleton road in 1886.

The driver, a tall, distinguished-looking man in his late 70's peered from the carriage as if looking for someone he knew. Soon, another man approached the carriage, exchanged greetings with the first, and the two men—Thomas Green Clemson and Benjamin Ryan Tillman—drove away together toward historic Fort Hill, a plantation some four miles away and the former homestead of John C. Calhoun, Clemson's late father-in-law.

Mr. Clemson had invited Senator Tillman to his home to discuss their mutual conviction that South Carolina needed a separate college devoted to industrial and scientific education. At Fort Hill, they met with Colonels D. K. Norris and R. W. Simpson. There the four "spent nearly the whole day in talking over the new project which Mr. Clemson had in mind and which he unfolded to us," Tillman later wrote.

Perhaps the most significant result of this conference was Mr. Clemson's decision to change a will he had made three years earlier and to execute a new will so as to serve better the great purpose which he had had in mind for many years.

Although his will of 1883 sought to provide for establishment of a scientific institution upon the Fort Hill place, Mr. Clemson later decided that his intention and purpose as stated in that will might be misunderstood.

In his new will, executed November 6, 1886, Mr. Clemson wrote that he desired to make his purpose plain and to make some other changes in the disposition of his property. He clearly explained the nature and purpose of his proposed institution, the establishment of which "is now the one great desire of my life."

"It should afford thorough instruction in agriculture and the natural sciences connected therewith; it should combine, if practicable, physical and intellectual education, and should be a high seminary of learning in which the graduate of the common schools can commence, pursue and finish the course of studies terminating in thorough, theoretic and practical instruction . . ."

The first item of the new will concerned disposition of the 814 acres of the Fort Hill place and was largely taken from the 1883 will.

The will gave to the State all that part of the Fort Hill Estate inherited by Mrs. Clemson (the former Anna Maria Calhoun who died in 1875, thirteen years before her husband) from her mother and the bulk of Mr. Clemson's other real and personal property. The latter amounted to a sum which, considering the purchasing power at the time, probably has been only a few times exceeded in a public benefaction in South Carolina.

Mr. Clemson's will also provided for a seven-member Board of Trustees that would govern and manage the new institution. Named were Colonels Simpson and Norris, M. L. Donaldson, R. E. Bowen, B. R. Tillman, J. E. Wannamaker, and J. E. Bradley who with those chosen by the General Assembly would constitute a governing board if the State accepted the bequest; but, who, in the event the State declined the bequest, would alone constitute a governing board for a private institution.

These seven trustees, along with other friends of the movement and the agricultural groups in the State, developed and organized a public opinion favorable to the plan.

In November 1889, the South Carolina General Assembly accepted the terms of Mr. Clemson's will and following the decision of the U.S. Supreme Court to uphold the will, the State of South Carolina and the full Board of Trustees proceeded to convert the dream of Thomas G. Clemson into the reality of Clemson College.

The institution formally opened in July 1893, with an enrollment of 446 students. The first graduating exercises were held in December 1896, with a graduating class of 37—15 in the agricultural courses and 22 in engineering courses.

The college was also established under the Morrill Land-Grant Act passed by the National Congress in 1862. Clemson University, therefore, is a member of the national system of Land-Grant Colleges and Universities.

In 1964, in recognition of expanded offerings of the institution not only in the areas of agricultural and mechanical arts but also in the sciences and arts, the name of the institution was changed to Clemson University. This change by the legislature, effective July 1, 1964, followed a recommendation to that body by the Board of Trustees.

LOCATION

The University is located on the Fort Hill homestead of John C. Calhoun, in the foothills of the Blue Ridge Mountains. It has an elevation of 800 feet above sea level and commands an excellent view of the mountains to the north and west, some of which attain an altitude of over 5000 feet.

The University is located at Clemson, South Carolina, on the main line of the Southern Railway. U.S. Highways numbers 76 and 123 pass through Clemson.

BUILDINGS AND GROUNDS

Campus architecture is a pleasing blend of the old and new complemented by a beautiful landscape of abundant trees, grassy expanses, and flowering plants and shrubs.

The campus proper consists of 1,400 acres. The academic buildings, student housing, service facilities and equipment are valued at \$168 million. Basically the campus is the site of Thomas Green Clemson's plantation, willed to South Carolina in 1888 for the establishment of the University. Fort Hill, former home of both Mr. Clemson and his father-in-law, John C. Calhoun, has been preserved at the center of the campus as a national shrine.

Challenges of the present—developing alternate energy sources and better conservation technology, improving agricultural production along with technology transfer, and improved health-care delivery—are symbolized by such buildings as the multipurpose center for the College of Nursing. Clemson's long, rich tradition of education, scientific research, and public service is brought to mind by historic structures like Tillman Hall and its clock tower, focal point of the campus, whose cornerstone was laid in 1891.

Beyond the main campus, stretching into Oconee, Pickens, and Anderson counties are another 24,000 acres of farm and agricultural and forestry research lands. Throughout the State are 8,300 more acres devoted to Agricultural Experiment Station research and 4-H Club activities.

One of the central features of campus development is the Robert Muldrow Cooper Library with its large reflection pool. This beautiful structure houses some 1,264,000 volumes, 224,000 equivalent volumes on microforms and other materials.

Facilities completed during the latter sixties and early seventies include three high-rise residence halls which house 1,296 students, a low-rise dormitory, a 24-bed hospital and out-patient clinic, and East Campus cafeteria, an arts and sciences classroom building and 10-story faculty office tower, and the multipurpose J. C. Littlejohn Coliseum which seats 11,000 people for basketball games and 12,000 for speaking engagements, concerts, and other functions.

Teaching and laboratory facilities of the College of Agricultural Sciences are housed in the R. F. Poole Agricultural Center complex. Another grouping serves the College of Engineering, including Olin Hall for ceramic engineering and Earle Hall for chemical engineering. These two buildings and their excellent equipment represent gifts from the Olin Foundation totaling nearly \$2 million.

Renovation of Surrin Hall, home of the College of Commerce and Industry was completed in the fall of 1981.

The College of Architecture is located in the modern, well-equipped Lee Hall. Other groupings of classrooms and laboratories serve the College of Education, College of Liberal Arts, and College of Sciences.

Teaching, laboratory, and administrative facilities of the College of Education are located in historic Tillman Hall. Industrial Education programs are housed in Freeman and Godfrey Halls.

Recent major additions to the campus include Jordan Hall for biological sciences and a multipurpose center for the College of Nursing. Complete renovation and expansion of McAdams Hall agricultural engineering building was completed in 1976.

A complex for the College of Forest and Recreation Resources and College of Agricultural Sciences administration was completed in 1975.

Other facilities include Jervey Athletic Center, and expansion of Lee Hall which houses the College of Architecture, Clemson University Union and related facilities, and additions and renovations at Fike Recreation Center, including a natatorium with a standard Amateur Athletic Union size swimming pool with tartan deck and a diving tank.

University housing consisting of residence halls and apartment units will accommodate 7,000 single students. Apartments are available for 100 married couples.

LIBRARIES

Current resources and facilities of Clemson's libraries make Clemson one of the most important research institutions in the Southeast. Today, the libraries have a collection of over one million items. Outstanding collections of journals, books, and primary research materials have been developed in many areas, especially agriculture, natural and physical sciences, economics and technology. In the social sciences, particularly strong manuscript collections have been developed around the papers of Vice President John C. Calhoun, South Carolina Governor James F. Byrnes, and Senator Edgar A. Brown. These and other resources are drawn on by scholars from all over the United States, Japan, and Europe. The library recently acquired the papers of South Carolina Senator Strom Thurmond; these soon will be made available for research.

Extensive use of the collection is made by borrowers from many parts of the Southeast through modern, efficient techniques. The libraries have a computerized catalog and circulation system called the LUIS. This makes the collections available for searching by terminals inside and outside the library and also provides accurate circulation control. The Cooper Library is linked by other computer terminals to more than 6,000 libraries through OCLC, Inc., for cataloging and inter-library loan services. Online bibliographic retrieval is available through the powerful data-base searching capabilities of BRS, Lockheed and SDC search services. A remote center with terminals accessing the Clemson mainframe computer is available in the library as well as a microcomputer laboratory.

In addition to the Robert M. Cooper Library, the University libraries consist of the Emery A. Gunnin Architectural Library in Lee Hall, the Sirrine Library (textiles and business) in Sirrine Hall, and a departmental library in Chemistry.

Except for adjustments in scheduling during holiday periods, Cooper Library is open Monday—Thursday, 7:45 a.m.-1:00 a.m.; Friday, 7:45 a.m.-11:00 p.m.; Saturday, 8:00 a.m.-6:00 p.m.; and Sunday, 1:00 p.m.-1:00 a.m.

Library policy requires that all students must present valid I.D. cards to check out library materials. New students are encouraged to visit with staff at the reference desk at any time to receive assistance with learning about the Library and to ask questions about collections, services, and policies.

COMPUTING FACILITIES

The Clemson University Division of Computing Information Technology (DCIT) supports student coursework and research through a network consisting of a NAS AS/XL-V60 with 128 megabytes of main memory and a vector processor running the MVS/SA operating system, and several VAX computers ranging in size from the MicroVAX II to the VAX 8820. Three VAXES—8600, 8650, and 8822—operate as VAXcluster running the VAX/VMS operating system. A VAX 8810 computer running the Ultrix operating system and a Floating Point Systems T20 Hypercube are available. Remote sites containing a variety of computers, terminals, and peripheral equipment are maintained in Martin, Riggs, Daniel, Lee, Lowry, Jordan, Brackett, Kinard, and Hunter halls and in Cooper Library. Dial-up telephone numbers are available as well as national and international network access.

STUDENT SERVICES

HOUSING

Single Student Housing University housing consisting of residence halls and apartment units will accommodate 7,000 single students. Rooms in residence halls are double occupancy, and the two-bedroom apartments will each accommodate four students. All single-student housing is air conditioned and furnished in a manner that meets the needs of today's college student. Upon returning a University Housing Application/Waiting List Card which is included in their application from the Admissions Office, new students are provided complete housing information. Graduate students and former students should write to the Housing Office for these materials. Refunds will be made in accordance with the housing contract.

Married Student Housing Clemson provides 150 apartments for married students. One hundred of these formerly served as faculty and staff housing and are located on the campus. The other 50 are located approximately one mile from the campus. Graduate students are given priority of assignment to married student housing. Brochures and application forms may be obtained by writing to the Family Housing Office, Clemson House, Clemson University, Clemson, South Carolina 29634-40725.

FOOD SERVICE

The University provides three economical board plans that can be used in two student dining halls and the Clemson House dining room. The student dining halls feature an unlimited seconds policy, except on some entrees, and the Clemson House serves meals on a la carte basis. Students dining at the Clemson House may use the meal card as a cash equivalency or for a predesigned meal at no additional cost. Meals also

may be purchased on a cash basis in the dining hall. The following are rates for 1988-89:

Seven-Day Board Plan (21 meals), Monday through Sunday—holidays excluded, \$700 per semester.

Five-Day Board Plan (15 meals), Monday through Friday—\$600 per semester.

Lunch-Only Board Plan (5 meals), Monday through Friday—holidays excluded, \$320 per semester.

The meal plan begins immediately after the student obtains a meal card at the beginning of a semester and ends after the evening meal on the day of graduation. The meal card is personal and may not be loaned, transferred, or sold to another person.

Students entering the University for the first time from high school or preparatory school and who live in University housing, excluding Calhoun Courts, Clemson House, and Thornhill Village Apartments are required to subscribe to a meal plan for their first semester. All other students have the option of selecting a meal plan on a semester basis or paying cash for individual meals at prevailing prices.

After paying for a meal plan either in the advance payment process or on registration day, no meal-plan changes that would cause a refund may be made during the first two weeks from the first day of registration. Following that period, meal-plan changes will be made only in the case of marriage, medical reasons, change in dormitory assignment to a dormitory room having kitchen facilities, conflict with working hours or class schedule, or other circumstances determined by the University to be beyond the student's control. Written documentation must be provided in all cases. Refunds will be prorated on a weekly basis.

HEALTH SERVICE

Student Health Service: Cost per Semester \$80. Payment of the Student Health Service fee is required of all students living in University housing and all full-time students even though they do not reside in University housing.

The Student Health Service is housed in the Redfern Health Center and is complete with outpatient department and a 24-bed hospital. A full-time staff consists of a director, five physicians, two clinical psychologists, fifteen registered nurses, one registered X-ray technician, two registered laboratory technicians, a registered pharmacist, and a health educator. In addition, a sufficient number of nurses' aides, secretarial workers, orderlies, and maids for 24-hour-a-day operation are employed. The best of modern equipment is available for student use. Regular office hours are maintained, plus the services of the nursing staff for minor ailments after hours. One physician is on call at night for emergencies whenever the school is open.

The Student Health Service at Clemson University has several important functions. All of these are aimed at keeping the student in good health so that he may effectively pursue his school work. There is, of course, the basic function of medical care for the ill and injured. This is a vital part of its work. In addition to this, the Student Health Service attempts to put strong emphasis on health rather than illness. This begins

with the entrance medical form. In laying out this form an attempt is made to get information, examinations, and preventive medical procedures carried out to better equip the staff in protecting the student from illness and to serve as a guide for the care of preexisting medical problems.

As the student progresses through his academic experiences, other procedures may be required or highly recommended. These are primarily an effort to teach the individual self-responsibility for maintenance of his own health, protection of the health of those around him, and location of possible hidden diseases. The Health Service also has the position as the source of medical information as well as responsibility for indicated medical action: diagnostic, therapeutic, or preventive.

The medical fee paid by each student covers the services of the University physicians, the Health Service staff, and equipment for most illnesses and injuries occurring on or around the campus. This coverage is given under conditions similar to that of one's own physician.

The fee does not cover routine physical examinations for employment or transfer to another school, fees for outside physicians when called in for consultation, medical or surgical services performed away from the University, or for accidents occurring off the campus.

A complete pharmacy is maintained and dispenses medication to students as prescribed by the staff physicians on a cost-plus service basis. Students are encouraged to pay for medications when received. When this is not possible, the Health Service will bill the student. A \$5 service charge is added when billing is necessary.

Clemson University maintains a licensed emergency medical service which includes a modern modular ambulance and sufficient certified emergency medical technicians for 24-hour-a-day service. All medical emergencies on campus will be handled by the unit. In addition, transportation for serious illnesses or emergencies requiring special care will be provided by the unit at no cost. Expenses for nonemergency transportation, however, are to be paid for by the student.

HANDICAPPED STUDENTS

Clemson University recognizes a handicapped student as anyone who has an impairment which substantially limits one or more of his or her major life activities.

In compliance with Section 504 of the Rehabilitation Act of 1973, Clemson University has appointed an adviser to the handicapped as well as a University Committee on the Handicapped. One of the primary responsibilities of the adviser and the Committee is to help integrate the handicapped student into the normal academic process.

Prospective students are invited to visit Clemson to determine how their needs might be met by the campus facilities and services. Additional information is available from the Assistant Director of Student Development Services, 101 Mell Hall, *telephone (803) 656-2153*.

MEDICAL QUESTIONNAIRE

Completion of a medical history questionnaire is required of all new students entering Clemson University for the first time. This is to be completed by the student and mailed directly to Redfern Health Center, Clemson University, Clemson, South Carolina 29634. Some help may be

needed from parents or family physician concerning necessary details about early childhood illnesses and immunizations.

Proof must be furnished of immunization for both red measles (Rubeola) and German measles (Rubella).

ACCIDENT AND SICKNESS INSURANCE

An accident and sickness insurance plan is available to all full- and part-time students and their dependents. Information concerning the insurance program is sent to students and parents with the fall semester prepayment material. Additional information may be obtained from the Student Health Service Office. This insurance is designed to cover major medical expenses not covered by the Health Service.

UNDERGRADUATE FINANCIAL AID

The Office of Student Financial Aid administers and/or coordinates various types of undergraduate financial aid administered by Clemson University: scholarships, loans, grants, and part-time employment. The office works jointly with the Financial Aid Committee and the Scholarships and Awards Committee.

Beginning in January of each year, students may apply to the Financial Aid Office for financial assistance for the next academic year. Financial aid requests, based on need, should be supported by a Financial Aid Form filed directly with the College Scholarship Services (CSS) and renewed annually.

The cut-off date for scholarship application submission is March 1. Work-study and loan applications should be received by the CSS processor by March 1. Application for the Pell Grant and Guaranteed Student Loan should be made by April 1.

A brochure detailing the Financial Aid Program at Clemson can be obtained from the Financial Aid Office, GO1 Sikes Hall, Clemson University or by calling (803) 656-2280.

COUNSELING SERVICES

The goal of the Counseling Center is to provide students with a service for personal counseling and self-improvement. College is filled with pressures, changes, and decisions. The Counseling Center offers students a place to come and speak confidentially about matters related to adjusting to adulthood and improving the ability to enjoy life and be productive.

The Center serves two large areas of concern: First, are performance issues, that is, ways to improve the quality and variety of an already successful lifestyle. Improvement in areas such as overcoming test anxiety, building motivational patterns that work, developing better time management skills and study skills, overcoming shyness, learning how to relax and how to motivate others are but a few of the many areas covered.

Secondly, are concerns that focus on helping students who are experiencing difficulties adjusting to college. Concerns in this area include feeling depressed, not being able to communicate clearly, homesickness, difficulties with love relationships, and other feelings that can disrupt a rewarding college experience.

All sessions are confidential and free of charge to Clemson University students. Appointments may be made by calling 656-2451 or stopping by the office on South Palmetto Boulevard.

COOPERATIVE EDUCATION

The Cooperative Education Program is a planned program in which students at the University combine alternate periods of academic study and periods of related work with a participating business, industry, agency, or organization. The work periods normally take place during the sophomore and junior years (including summers), while the freshman and senior years are spent in full-time study.

Students qualify for participation in the Cooperative Education Program by satisfactory completion of thirty semester hours of academic work. Transfer students may qualify in one semester. Three, four, or five co-op work periods are projected and included in each student referral. Usually two students from the same academic area are paired to fill a full-time work position with a participating employer. While one student is at work the other is enrolled in classroom study at the University.

Students enrolled in the Cooperative Education program pay a registration fee of \$15 each semester or summer session which coincides with their work period. That fee enables students to maintain student status and participate in student activities and services that are normally associated with being enrolled at the University. However, the fee does not cover the cost of tuition for academic courses, health service, or any of the other benefits normally associated with the standard University fee. In responding to insurance, tax, loans, and other questionnaires about status, the University classifies a student on work assignment to be a full-time continuing student. The work assignment is considered an integral part of the student's education, but no academic credit is awarded for this experience.

The Cooperative Education Program is offered to students enrolled in academic departments or programs in the Colleges of Agricultural Sciences, Architecture, Commerce and Industry, Education, Engineering, Forest and Recreation Resources, Liberal Arts, and Sciences.

CAREER SERVICES AND PLACEMENT

The Career Services and Placement Office provides assistance to students who seek permanent employment, internships, or summer work. The Office does not place candidates but assists them by providing counseling and seminars on career planning, job search, resume preparation, and interview techniques. Students are also encouraged to utilize the Placement Library consisting of reference books, video tapes, and literature provided by companies and agencies.

The Placement Office coordinates and plans campus interview visits with representatives from business, industry, and government agencies. These interviews are scheduled in the fall and spring semesters for qualified seniors or graduate students who are registered with the Placement Office. Employer information is on the computer mainframe to facilitate research.

Alumni seeking employment are encouraged to utilize the services of the Placement Office for counseling and guidance in their job search. Alumni are also eligible to receive the *Alumni Career Services Bulletin*, a weekly publication listing current job opportunities.

INTERNATIONAL PROGRAMS AND SERVICES

Clemson University provides a number of opportunities for students to gain a global perspective, increase their knowledge of other countries and languages, and develop cross-cultural sensitivities.

International Student Exchange Program (ISEP) allows an undergraduate student to register and pay tuition, fees, and room and board at Clemson University and to enroll for a semester or year at one of more than seventy universities worldwide. As an ISEP participant, one enrolls as a regular student at the host institution, takes the same courses, and participates in the same activities as regularly enrolled students at the foreign institution. Transfer credit is available upon approval. Application deadlines are normally in February.

Clemson University colleges that participate in studies abroad include Commerce and Industry, Engineering, and Liberal Arts. The College of Architecture offers a program in Italy for Architecture majors. In addition, there are a variety of excellent opportunities for study abroad under the sponsorship of other United States colleges and international organizations.

For more information about the programs above, contact either the Office of International Programs and Services, E-201 Martin Hall; the Vice Provost for Undergraduate Studies, 209 Sikes Hall; or any of the colleges above.



Reunion of 1910 — Wives of the first graduating class.



Tillman Library CA 1911

Scholastic Regulations

Proper discharge of all duties is required at Clemson University, and a student's first duty is his scholastic work. All students should be thoroughly acquainted with and cognizant of these basic requirements.

Credit System The semester hour is the basis of all credits. Generally, one recitation hour or three laboratory or shop hours a week for a semester constitute a semester hour. Thus, in ENGL 101, Composition I, 3(3,0), as you will find this subject listed in the Course Descriptions, the student takes three semester hours. When the course is completed satisfactorily, three credit hours are entered on the student's record. The notation "3(3,0)" means that the course carries three credits, has three clock hours of theory or recitation per week, and no laboratory hours. CH 101, General Chemistry, 4(3,3), carries four semester hours, has three hours of theory, and a three-hour laboratory period.

Grading System The grading system is as follows:

A—*Excellent* Indicates that the student is doing work of a very high character, the highest grade given.

B—*Good* Indicates work that is definitely above average, though not of the highest quality.

C—*Fair* Indicates work of average or medium character.

D—*Pass* Indicates work below average and unsatisfactory, the lowest passing grade.

F—*Failed* Indicates that a student knows so little of the subject that it must be repeated in order that credit may be received.

I—*Incomplete* Indicates that a relatively small part of the semester's work remains undone. Grade I is not given a student who made a grade F on his daily work. Students are allowed thirty days after the beginning of the next scheduled session, excluding summers and regardless of the student's enrollment status, to remove the incomplete grade. Normally, only one extension for each I may be granted, and this under unusual circumstances. The extension must be approved in writing by the instructor of the course and the head of the department in which the course was taken. The extension will indicate the nature and amount of work to be completed and the time limit. (Students under this policy are prohibited from removing the I by repeating the course.) A letter grade of I converts to F unless the incomplete is removed within the time specified.

W—*Withdrew* This grade indicates that the student withdrew from the course or was withdrawn by the instructor after the first four weeks of classwork and prior to the last five weeks of classes, not including the examination period. Each undergraduate student is allowed to withdraw or be withdrawn with a grade of W from no more than 14 hours of coursework during the entire academic career at Clemson University. Transfer students may withdraw from no more than 10 percent of the total work remaining to be done in the chosen undergraduate curriculum at the time of transfer to Clemson University up to a total of 14

hours of coursework, whichever is fewer. Partial credit for courses cannot be dropped. A student who exceeds these limits of hours or who is enrolled during any part of the last five weeks of classes shall have final grades recorded. These restrictions apply to withdrawal from the University as well. Any variance from these restrictions must be approved by the Provost or the Provost's designee.

Pass/Fail Option Juniors or Seniors enrolled in a four-year curriculum may take four courses (maximum of 15 credit hours), with not more than two courses in a given semester on a Pass/Fail basis. Transfer and five-year program students may take Pass/Fail courses on a pro rata basis.

Only courses to be used as free electives may be taken optionally as Pass/Fail.

Letter-graded courses which have been failed may not be repeated Pass/Fail.

Honors Program may exercise an option as to acceptance of Pass/Fail grading for Honors courses.

Registration in Pass/Fail courses will be handled in the same manner as for regular enrollment. Departmental approval must be obtained via approval form and returned to the Office of Admissions and Registration in accordance with the University Calendar for adding courses.

Instructors will submit letter grades to the Office of Admissions and Registration. These grades will then be converted as follows: A, B, C to P (pass); D, F to F (fail). Only P (minimum letter grade of C) or F will be shown on a student's permanent record and will not affect the grade-point ratio.

If a student changes to a major which requires a previously passed course, and this course has been taken Pass/Fail, he may request either to take the course on a letter-graded basis, the P be changed to C, or substitution of another course.

In the event limited enrollment in a class is necessary, priority will be given as follows: majors, letter-graded students, Pass/Fail students, and auditors.

Final Examinations The standing of a student in his work at the end of a semester is based upon daily classwork, tests or other work, and the final examinations. Faculty members may excuse from the final examinations all students having the grade of A on the work of the course prior to the final examination, but for all other students written examinations are required in all subjects at the end of each semester, except in certain laboratory or practical courses in which final examinations are not deemed necessary by the department faculty.

Final examinations must be given on the dates and at the times designated in the final examination schedule.

Grade Reports Scholastic reports are mailed to students four times each year, including a preliminary statement of progress on undergraduate courses only near the middle of each semester and a final report on all courses at the end of each semester.

Dropping Classwork A subject dropped after the first four weeks of classwork and prior to the last five weeks is recorded as W—Withdrew.

Repeating Courses Failed A student who has failed a course (made F) cannot receive credit for that subject until it has been satisfactorily repeated hour for hour in class, except that in the case of correlated laboratory work, the number of hours to be taken shall be determined by the instructor. Where separate grades for class and laboratory work are given, that part of the subject shall be repeated in which the failure occurs. Successfully repeating a course previously graded F does not erase the original F grade from student's record. Both grades will appear on the record and will be computed in the grade-point average.

Repeating Courses Passed A student may repeat a course he has passed with a grade lower than B. Both grades will be calculated in the grade-point average. However, credit for the course will be counted only once toward the number of hours required for graduation.

Grade Protests A student wishing to protest a course grade must first attempt to resolve any disagreement with the instructor. In failing to reach a satisfactory resolution, the student may follow the procedures listed under "Student Academic Grievance Committee" in the *Student Handbook*. All grade changes and grievances must be filed within 120 calendar days from the date printed on the grade report. This regulation will become effective Summer School 1988.

Advanced Placement and Credit by Examination In addition to earning credit by the usual method involving classroom attendance, a student may receive credit toward his degree by completing a course successfully by examination only.

Freshmen interested in exempting some of the elementary courses in this manner should participate in the College Board Advanced Placement Examination program and have the results of these tests sent to Clemson.

Certain departments will also grant credit for successful completion of College-Level-Examination Program (CLEP) subject examinations which are administered by the College Board.

Credit may be earned by enrolled students by means of a special examination without the necessity of class attendance subject to the following requirements:

1. The applicant must present evidence which would indicate that he has received training or taken work which is approximately equivalent to that given in the course at Clemson for which an examination is requested and that an examination is warranted.

2. The applicant must not have previously failed or audited the course at Clemson.

3. The applicant must apply in writing for the examination and the request must be approved by the instructor, head of the department in which the course is taught, dean of the college in which the course is taught, and the Dean of Admissions and Registration. Application forms are available in the Office of Admissions and Registration.

4. Credit (CR) will be awarded for acceptable work in lieu of letter grades in recognition of college-level achievement as determined by College Board Advanced Placement Examination, College-Level-Examination Program subject examination, institutional special examinations, and similar instruments.

Work Taken at Another Institution Clemson students may receive credit for work taken at another institution; however, approval of the work should be obtained by the student prior to scheduling the work. By obtaining advance approval, the student is assured of receiving proper credit at Clemson provided he passes the work with a grade of C or higher. Information and forms relative to this approval may be obtained in the Office of Records, 104 Sikes Hall.

No course taken at a nonbaccalaureate-degree institution may be used as an equivalent or substitute for any 300- or 400-level Clemson course.

Classification All new students are classified as freshmen unless they have attended another college prior to entrance. Students who have completed college work elsewhere will be classified on the basis of semester hours accepted at Clemson rather than the amount of work presented. In order to be classified as a member of any class other than freshman, students must meet the credit-hour requirements indicated below:

Sophomore—30 credit hours

Junior—60 credit hours

Senior—95 credit hours

Credit Load Except for an entering freshman who is restricted to the curriculum requirements of his major course, the credit load for an undergraduate must be approved by his class adviser. The class adviser will approve a credit load deemed in the best interest of the student based on such factors as course requirements, grade-point ratio, participation in other activities, and expected date of graduation.

The maximum number of hours in which a student may enroll is 21, and 15 is the maximum credit hours for those on probation. Written permission of the department head in which the student is a major is required for all registration involving more than 21 hours, or 15 maximum credit hours for those on probation.

ROTC Credit Ten hours of aerospace studies or military science may be counted toward the baccalaureate degree in any curriculum.

Grade-Point Ratio In calculating a student's grade-point ratio, the total number of grade points accumulated by the student is divided by the total number of credit hours taken at Clemson during the semester, session, or other period for which the grade-point ratio is calculated. For each credit hour the student receives grade points as follows: A—4, B—3, C—2, D—1. No grade points are assigned for grades of F, I, or W.

Academically Deficient Student Status This academic status indicates that the student does not meet the continuing enrollment policy but is eligible to attend Clemson Summer Sessions and/or to appeal to the Appeals Committee on Continuing Enrollment to become eligible for enrollment in the fall or spring semester.

Continuing Enrollment Policy At the end of any enrollment period, a notice of academic probation shall be placed on the grade report of an undergraduate student if his/her cumulative grade-point ratio is below 2.0, which is the minimum necessary for graduation.

In the event that a student is placed on academic probation, notification to that effect will be placed on the grade report for that session in

which the student's academic deficiency occurred and for each session the student remains on probation. The student who clears probation by returning to the graduating academic requirement (2.0) will have notice of that effect placed on the grade report for that session. No notation concerning probation is placed on the student's permanent record.

A student on academic probation will be subject to suspension or dismissal at the end of a subsequent spring semester and/or summer session if his/her cumulative grade-point ratio is below the minimum standards for continuing enrollment. In exceptional cases, the dean of the college in which the student is enrolled may recommend to the Provost that a student with a grade-point ratio below these standards be suspended or dismissed at the end of any session of enrollment.

The "credit level" used in connection with the minimum cumulative grade-point ratio requirement is based on all credits taken at Clemson, plus any advanced standing received from transfer credits and credits based on approved examination programs.

<i>Credit Level</i>	<i>Required Minimum Cumulative Average</i>
11-20	1.4
21-50	1.6
51-80	1.9
81 or more	2.0

However, a student on probation who averages at least 2.3 grade-point ratio since most recently entering probationary status and passes a minimum of 12 credits each fall and spring semester of enrollment during that period will be permitted to continue enrollment on probation even though his/her cumulative grade-point ratio is below the standard given above.

Initial failure to qualify for continued enrollment will result in suspension from the University for the next regular academic semester. Notice of academic suspension will appear on the permanent record.

Suspended students will be permitted to enroll in summer school and may have their regular enrollment reinstated immediately if the summer school work brings their cumulative grade-point ratio above the minimum standard. In extraordinary cases, suspended students may appeal their suspension after completion of summer school. This appeal may be made to the Appeals Committee on Continuing Enrollment. Only one such appeal may be made before suspension begins. Appeals will be granted only in the most exceptional cases.

Upon readmission after suspension, necessarily still on probation, a subsequent failure to meet the requirements for continued enrollment before clearing probation will result in dismissal from the University, and notice of dismissal for reasons of academic ineligibility will be entered on the permanent record. A student who has been dismissed may petition the Appeals Committee on Continuing Enrollment for readmission after at least one regular semester. A denied appeal does not preclude subsequent appeals after an intervening regular semester.

Academic Renewal The student who has not enrolled for a period of two or more academic years may apply to the Appeals Committee on Continuing Enrollment for readmission under special conditions known

as academic renewal. Under these conditions, the previous credits attempted and quality-point deficit will not constitute a liability in a new grade-point computation. However, no credits passed or their attending quality points will be available to the student for a degree at Clemson. The previous record will appear on the permanent record as well as the notation of readmission under the policy of academic renewal.

Withdrawal from the University A student may withdraw from the University subject to the restrictions in the section on W — Withdraw. Students who exceed these restrictions shall have final grades recorded. Any variance from the restrictions must be approved by the Provost or the Provost's designee and ordinarily must be requested within 120 calendar days from the date printed on the grade report.

Class Attendance Regular and punctual attendance at all class and laboratory sessions is the responsibility of each student. College work proceeds at such a pace that regular attendance is necessary in order for each student to obtain maximum benefits from instruction. All absences are matters to be resolved between the instructor and the student. In the event that a student finds it necessary to be absent from class, it is the student's responsibility to make up resulting deficiencies.

In an early class the instructor shall inform the students of the attendance policy for that class. (Departments may establish uniform attendance policies for multiple section courses.) A student who incurs excessive absences may be dropped from a course by the instructor.

Students desiring to withdraw from a class must secure a drop card from the Registrar's Office prior to terminating attendance. A student enrolled in the last five weeks of classes shall have final grades recorded.

Course Prerequisites Prerequisites for individual courses are enumerated under the course listings in the Description of Courses. In addition to these requirements, colleges and departments may also establish other standards as conditions for enrollment. In the College of Engineering a grade-point ratio of 1.8 or higher is required for registration in all engineering courses numbered 300 or higher. For undergraduate students who enter Clemson after May 15, 1983, the College of Engineering will require a cumulative grade-point ratio of 2.0 or higher for registration in all engineering courses numbered 300 or higher. In the Department of Electrical and Computer Engineering, a student is allowed to enroll in a departmental course, excluding ECE 307, 308, 309, and 310 only when all prerequisites for that course have been passed with a grade of C or higher. In the College of Nursing, a grade-point ratio of 2.0 or higher is required for registration in all nursing courses numbered 300 or higher. The College of Education requires a cumulative grade-point ratio of 1.8 or higher to enroll in 300-level courses and a cumulative grade-point ratio of 2.0 for 400-level courses. Directed teaching and teaching methods courses require a minimum cumulative grade-point ratio of 2.0.

Auditing Policies Qualified students may audit courses upon the written approval of the instructor. Auditors are under no obligation of regular attendance, preparation, recitation, or examination and receive

no credit. Participation in classroom discussion and laboratory exercises by auditors is at the discretion of the instructor. A student who has previously audited a course is ineligible for credit by examination.

Undergraduate and graduate students enrolled in 12 or more hours may audit courses at no additional charge. Others interested in auditing courses should verify their eligibility through the Registrar's Office.

Academic Advising Each student is assigned to an academic adviser in his/her major area. It is the responsibility of the student to consult with the adviser during preregistration and to obtain the adviser's signature for adding and dropping courses. The adviser will assist the student in scheduling courses so as to fulfill the requirements of the degree program. Nevertheless, it is the responsibility of the student to fulfill the relevant requirements of the degree. Advisers also maintain files on individual advisees to assist in academic planning.

Academic Records The student's permanent academic record is maintained in the Registrar's Office and contains personal identifying information, grades, and credits. Where appropriate, statements of a corrective nature, withdrawals, suspension for failure to meet academic standards, suspension for disciplinary reasons, and graduation data are added. It is a historical record of the student's academic progress.

ACADEMIC HONORS

Honor Graduates To be graduated with honors a student must have a minimum cumulative grade-point ratio as follows: cum laude—3.4, magna cum laude—3.7, and summa cum laude—3.9.

Honor Lists At the end of the fall and spring semesters, the following lists shall be compiled of undergraduate students who have achieved grade-point ratios of 3.5 to 4.0 on a minimum of 12 semester hours, exclusive of Pass/Fail coursework.

Dean's List — 3.5 to 3.99 grade-point ratio

President's List — 4.0 grade-point ratio

Honors Program The Honors Program of Clemson University is known as Calhoun College, and students enrolled in honors work are called Calhoun Scholars. To enter or to remain in Calhoun College a student must have a cumulative grade-point ratio of 3.4. Admission to Calhoun College for incoming freshmen is by invitation, based primarily on SAT scores and high school academic records.

Calhoun College is under the direction of the chairperson of the Honors Program Committee, a group comprising faculty members from each college. The official *Calhoun College Handbook* is available in the chairperson's office, 532 Clemson House.

Students graduating in the Calhoun College program will have the fact indicated on their diplomas.

Honors and Awards The University offers a number of awards for outstanding achievement in specific fields and endeavors. Recipients are chosen by selection committees and are announced at the annual Honors and Awards Day program or other appropriate ceremonies. Detailed information relating to such awards is available in the offices of the academic deans and department heads.

GRADUATION REQUIREMENTS

A candidate for an undergraduate degree is a student who has turned in a completed diploma application by the deadline prescribed in the University Calendar for a particular graduation date.

Residence Requirement In order to qualify for an undergraduate degree, a student must spend at least the last year of residence at Clemson and complete at Clemson a minimum of 30 of the last 36 credits presented for the degree.

Make-up of I's Received in Last Semester A candidate for a degree who in the semester immediately prior to graduation receives one or more grades of I shall have an opportunity of removing the unsatisfactory grades provided the final grades are received in the Office of Admissions and Registration by the time grades for candidates for graduation are due.

A candidate who qualifies for graduation under this regulation will be awarded his degree on the regular date for the award of degrees.

Special Requirements A cumulative grade-point ratio of 2.0 is required for graduation. Candidates for degrees are required to apply for their diplomas within three weeks following the opening of the final semester or the opening of the summer session prior to the date the degrees are to be awarded. These applications should be filled out in the Office of Admissions and Registration on the regular blanks provided.

All work for a degree must be completed, all financial settlements made, and all government property and library books returned by 5 p.m. on the Tuesday preceding graduation.

Credit Limitation If all work toward a degree is not completed within six years after entrance, the student may be required to take additional courses.



Operating Day at Veterinary Hospital CA 1900



Clemson College Faculty 1894

Degrees and Curricula

Undergraduate curricula are offered under the colleges of Agricultural Sciences, Architecture, Commerce and Industry, Education, Engineering, Forest and Recreation Resources, Liberal Arts, Nursing, and Sciences.

The University grants the following degrees upon satisfactory completion of the requirements prescribed by the colleges listed.

College of Agricultural Sciences

Agricultural Economics and Rural Sociology	BS
Agricultural Industries	
Community and Rural Development	
Agricultural Education	BS
Agricultural Engineering ¹	BS
Agricultural Mechanization and Business	BS
Agronomy	BS
Animal Industries	BS
Animal Science	
Dairy Science	
Poultry Science	
Aquaculture, Fisheries, and Wildlife Biology	BS
Entomology	BS
Food Science	BS
Horticulture	BS
Turfgrass	
Packaging Science	BS
Plant Pathology	BS

College of Architecture

Building Science and Management	BS
Design	BA, BS
Architecture	
City and Regional Planning	
Fine Arts	BFA
Landscape Architecture	BLA

College of Commerce and Industry

Accounting	BS
Economics	BA, BS
Financial Management	BS
Industrial Management	BS
Management	BS
Marketing	BS
Textile Chemistry	BS
Textile Management	BS
Textile Science	BS

College of Education

Early Childhood Education	BA
Elementary Education	BA
Graphic Communications	BS
Industrial Education	BS
Science Teaching	BS
Biological Sciences	
Earth Science	
Mathematics	
Physical Sciences	
Secondary Education	BA
English	
History	
Mathematics	
Modern Languages	
Political Science	
Social Sciences	

College of Engineering

Agricultural Engineering ¹	BS
Ceramic Engineering	BS
Chemical Engineering	BS
Civil Engineering	BS
Computer Engineering	BS
Electrical Engineering	BS
Engineering Analysis	BS
Industrial Engineering	BS
Mechanical Engineering	BS

College of Forest and Recreation Resources

Forest Management	BS
Forest Products	BS
Parks, Recreation, and Tourism Management	BS

College of Liberal Arts

English	BA
History	BA
Language and International Trade	BA
Modern Languages	BA
Philosophy	BA
Political Science	BA
Psychology	BA
Sociology	BA

¹Jointly administered by the College of Agricultural Sciences and the College of Engineering.

College of Nursing

Nursing	BS
---------	----

College of Sciences

Biochemistry	BS
Biological Sciences	BA, BS
Chemistry	BA, BS
Computer Information Systems	BS
Computer Science	BS
Geology	BA, BS
Mathematical Sciences	BA, BS
Medical Technology	BS
Microbiology	BS
Physics	BA, BS
Prepharmacy	Nondegree
Prephysical Therapy	Nondegree

BACHELOR OF ARTS AND BACHELOR OF SCIENCE IN PREPROFESSIONAL STUDIES

Clemson University will award the degree of Bachelor of Arts or Bachelor of Science in Preprofessional Studies to a student who has satisfactorily completed three years of undergraduate work in an appropriate curriculum and the first year of work in an accredited medical, dental, veterinary, law, or other accredited, professional, postgraduate school, provided the student fulfills the requirements for the three-year program as follows and the other specified conditions are met.

1. At least two of the three years of preprofessional work, including the third year, must be taken in residence at this University.

2. A minimum of three years of undergraduate work (i.e., preprofessional school credit) must be presented.

3. Normal progress must have been made toward fulfilling the degree requirements of the curriculum in which the student is enrolled at Clemson.

4. The student applying for the Bachelor of Arts or Bachelor of Science in Preprofessional Studies must be recommended by the college at Clemson in which the curriculum that he/she is majoring as a Clemson student is located or by the college in which three years of normal progress toward a degree can be identified.

5. If the combination of preprofessional work taken and the work in the first year of professional school is equivalent to that which is required in some other bachelor's degree program at Clemson, the college concerned may recommend the other bachelor's degree.

The above requirements and conditions became effective July 1, 1974, and will apply to all students who satisfy these requirements and conditions after that date.

A Clemson student having left the University before receiving the bachelor's degree (prior to July 1, 1974), and having enrolled immediately in an accredited, professional, postgraduate school may apply for a bachelor's degree from Clemson and have his/her application considered on an individual basis. The college(s) at Clemson considering the application are authorized to examine the student's entire record in both preprofessional and professional studies and exercise their own judgment concerning the three-year requirement for preprofessional studies.

SECOND BACCALAUREATE DEGREE

To complete a second baccalaureate degree, a student must complete a minimum of 30 semester hours at Clemson in addition to the greater number of hours required for either degree and satisfy all course and grade requirements for the second degree.

DOUBLE MAJOR

A student in a bachelor of arts degree program may be awarded a single baccalaureate degree with a double major. The two majors may be within a single college or may involve two colleges, but are limited to Bachelor of Arts degree programs.

MINORS

In the Bachelor's degree in arts and sciences, the faculty in any curricular area may propose through the appropriate curriculum committee or committees to the University Undergraduate Curriculum Committee permission for its undergraduate students to enroll in any or all of the minor fields (except in minors in the student's own curricular area) as specified in the Minors List in the *University Announcements*.

At the minimum, in the Bachelor's degrees in the arts and sciences, a minor will consist of no fewer than 15 semester credit hours with no fewer than 9 semester credit hours at the 300 level or higher.

GRADUATE DEGREES

The degrees of Doctor of Philosophy; Doctor of Education; Education Specialist; Master of Arts; Master of Science; Master of Agricultural Education; Master of Architecture; Master of Building Science and Management; Master of Business Administration; Master of City and Regional Planning; Master of Education; Master of Engineering; Master of Fine Arts; Master of Forestry; Master of Industrial Education; Master of Nutritional Sciences; Master of Parks, Recreation, and Tourism Management; and Master of Professional Accountancy are awarded to those students who satisfactorily complete prescribed graduate programs.

For further information concerning advanced degrees see *The Graduate School Announcements*, which may be obtained from the Office of the Dean of the Graduate School.

COURSE NUMBERS

In the curricula which follow are given the official titles and number of the courses, the descriptive titles and the number of semester hours credit.

GENERAL EDUCATION REQUIREMENTS

An undergraduate student whose enrollment in a curriculum occurs after May 15, 1984, must fulfill the general education requirements in the catalog in effect at the time. A student who withdraws from the University and subsequently returns after May 15, 1984, will be required to satisfy the general education requirements. Any variation in curricular or general education requirements shall be considered under the substitution procedure.

The general education requirements in some curricula are more restrictive than the general requirements shown below.

- A. Composition and Speaking Skills 9 hours
 - 1. English 101, 102
 - 2. Three hours from English 231, 304, 312, 314, 316, 345, 346, 347; Speech 250
- B. Mathematics 6 hours
 - 1. Six hours taken from any course in mathematical sciences and Experimental Statistics 301
- C. Science and Technology 11 hours
 - 1. A two-semester sequence in the same physical or biological science, each including a laboratory
 - 2. At least an additional 3 hours in an applied science to be selected from the following:
 - Any introductory physical or biological science, except the science selected to fulfill C 1 above
 - Agricultural Engineering — All courses except 471, 473
 - Agricultural Mechanization — All courses except 408, 472
 - Agriculture — All courses except 301, 401, H491, H492
 - Agronomy — All courses except 350, 406, 455, 456
 - Animal Physiology 301, 460
 - Animal Science — All courses except 205, 360, 406, 422
 - Anthropology 110
 - Architecture 425, 488
 - Astronomy 301, 302, 401, 402, 403, 410
 - Biochemistry 431
 - Biological Science 201, 202, 241, 280
 - Botany 145, 203, 221
 - Building Science 201, 202, 203, 301, 302, 304, 403
 - Computer Science 101, 110, 120, 130
 - Dairy Science — All courses except 401, 409, 490
 - Economics 311, 430
 - Education 458, 497
 - Engineering — All Engineering-designated courses or combination of courses that are 3 hours or more
 - Entomology — All courses except 461, 462, 468, 490
 - Environmental Science 432, 471, 472
 - Experimental Statistics 301, 462
 - Food Science — All courses except 417, 418, 420, 421, 491
 - Forestry 205, 206, 221, 222, 251, 252, 253, 254, 255, 302, 305, 306, 308, 310, 312, 325, 403, 405, 409, 411, 412, 413, 415, 420, 424, 429, 430, 431, 432, 434, 436
 - Genetics — All courses
 - Geography 310
 - Geology 210, 220, 306, 400, 401, 402, 403, 405, 407, 408, 413
 - Graphic Communications 104
 - Health — All courses

Horticulture — All courses except 304, 308, 407, 409, 416, 461, 462, 470, 471
 Industrial Education 102, 105, 203, 205, 208, 316, 320, 415, 418
 Management 302, 308, 320, 322, 401, 419
 Management Science 310, 413, 414
 Mathematical Sciences 231
 Microbiology 100
 Nursing 300
 Nutrition — All courses
 Packaging Science — All courses
 Parks, Recreation, and Tourism Management 203
 Physics 240, 245, 262, 340, 341, 473
 Plant Pathology — All courses
 Poultry Science — All courses except 405, 406, 460, 471
 Textile Chemistry 315, 316, 405, 406
 Textile Management and Textile Science 175, 176, 201, 202, 308, 313, 314, 321, 322, 414, 426, 440, 460
 Wildlife and Fisheries Biology — All courses except 490, 499
 Zoology 456

D. Humanities 6 hours

1. Three hours selected from sophomore literature courses (200 level only) or foreign language literature (300 level or higher)
2. Three hours selected from the following (excluding practica):
 - Art and Architectural History — All courses except 411, 412
 - English — All courses except 100, 101, 102, 111, 217, 231, 304, 312, 314, 316, 331, 333, 334, 335, 345, 346, 347, 392, 485, 490
 - French — All courses, 300 level or higher, except 305, 409
 - German — All courses, 300 level or higher, except 305, 411, 412
 - Humanities — All courses
 - Italian — All courses, 300 level or higher
 - Language and International Trade 400
 - Liberal Arts 110, H110
 - Music 151, 152, 210, 251, 252, 301, 306, 311, 312, 315, 316, 362, 363, 365
 - Philosophy — All courses
 - Religion — All courses
 - Russian — All courses, 300 level or higher
 - Spanish — All courses, 300 level or higher, except 305, 409, 411
 - Speech — 360, 361, 363, 365, 366, 369
 - Theatre — 375, 376, 378, 475, 476, 477
 - Visual Arts — All courses
 - Women's Studies 301, 498

E. Social Sciences 6 hours

1. Six hours selected from the following:
 - Agricultural Economics — All courses
 - Anthropology — All courses except 110
 - Economics — All courses except 311, 430
 - Geography — All courses except 310
 - History — All courses
 - International Studies 201
 - Liberal Arts H111
 - Political Science — All courses
 - Psychology — All courses
 - Rural Sociology 303, 359, 371, 401, 403, 471, 495, 498
 - Science and Technology in Society 300
 - Sociology — All courses

COLLEGE OF AGRICULTURAL SCIENCES

Modern agriculture involves the science, business, and art of producing, processing, and distributing plant and animal products and includes economics and human relations associated with these activities. Agriculture is a unique educational area because of the economic and human welfare implications in the application of the basic sciences to biological problems and materials and the wise use and conservation of natural resources.

Thousands of agricultural graduates are needed annually to serve this basic industry. Our land-grant colleges and universities are graduating less than the number demanded to fill careers with a future, with a challenge, and careers that indeed serve humankind.

Today's agriculture includes much more than farm production. Agriculture is a complex profession. About 6 million people provide supplies and services for farmers, and 10 million process and distribute farm products. These two segments, together with farm production which employs 5 million workers, provide careers somewhere in agriculture for 21 million Americans—approximately one-third of all jobs.

The College of Agricultural Sciences offers twelve Bachelor of Science majors, one of which is jointly administered with another college: Agricultural Engineering with the College of Engineering. Within these twelve degree majors, a student may select from the following curricula: Agricultural Economics and Rural Sociology with curricula in Agricultural Industries and Community and Rural Development; Agricultural Education; Agricultural Engineering; Agricultural Mechanization and Business; Agronomy with study areas in Agronomic Systems, Soil and Environment, and Weed Science; Animal Industries with curricula in Animal Science, Dairy Science, and Poultry Science; Aquaculture, Fisheries, and Wildlife Biology; Entomology; Food Science; Horticulture with a curriculum in Turfgrass; Packaging Science; and Plant Pathology.

MINOR CONCENTRATIONS

The curricula in agriculture are designed to provide a solid foundation of principles on which to solve problems and to do this in a practical setting of real-world situations.

All curricula provide a solid educational foundation in addition to preparation in a specialized field of agriculture. This combination serves to open a variety of career opportunities.

Curricula stress development of skills in five general areas; the relative emphasis may vary, and all curricula meet the University general education requirements: (1) communications (spoken and written including foreign languages), (2) business, (3) people management, (4) problem recognition/problem solving (use of basic sciences), and (5) a field of technical agriculture.

Several curricula require or suggest minor areas of concentration to provide educational breadth; others satisfy this through electives. In either case, students work closely with advisers to develop suitable groups of courses to meet individual needs. These minor areas include fields such as business, international agriculture, science (for students

considering graduate or professional schools), and a second field of technical agriculture. Other groupings can be made on an individual basis.

GRADUATE STUDY

The College of Agricultural Sciences also offers programs leading to the Master of Agricultural Education, Master of Nutritional Sciences, Master of Science, and Doctor of Philosophy degrees.

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

The Agricultural Economics and Rural Sociology major includes curricula in Agricultural Industries and Community and Rural Development.

AGRICULTURAL INDUSTRIES

The curriculum in Agricultural Industries places emphasis on a strong background in economics with applications to agricultural and agriculturally-related businesses. Also included are courses in basic agricultural and biological sciences, liberal arts, and business. Students have eighteen hours of free electives that may be used for further specialization or to broaden the educational experience.

Students have the opportunity to concentrate in one of several areas of specialty as follows: Agri-Industries Management, Agri-Marketing, Agricultural Administration, Agricultural Finance, Agricultural Sales and Merchandising, Economics, Farm Management, and Real Estate.

Employment opportunities open to graduates with an Agricultural Industries curriculum are many. These include sales and promotional work for a variety of businesses, management positions in the farm-loan departments of private banks or with cooperative farm credit agencies, public relations activities for various firms, market managers and directors, county agents, representatives of government agencies serving agriculture, and operators of numerous enterprises.

FRESHMAN YEAR

First Semester		Second Semester	
AGRIC 103 Intro. to Animal Industries	3	AGRIC 104 Intro. to Plant Sciences	3
AGRIC 105 Agriculture and Society	2	ENGL 102 Composition II	3
ENGL 101 Composition I	3	MTHSC 102 Intro. to Math. Analysis	3
MTHSC 101 Finite Probability	3	PHIL 102 Intro. to Logic	3
Science Requirement ¹	4	Science Requirement ¹	4
	15		16

SOPHOMORE YEAR

ACCT 201 Principles of Accounting	3	ACCT 202 Principles of Accounting	3
ECON 212 Principles of Economics	3	AGEC 202 Agricultural Economics	3
EXST 301 Introductory Statistics	3	AGEC 308 Quant. Agric. Economics	3
or MTHSC 203 Elem. Stat. Infer.	3	CPSC 110 Elem. Comp. Prog.	3
Communication Requirement ²	3	or CPSC 120 Intro. to Infor. Proc. Sys.	3
Science Requirement ³	3	Communication Requirement ²	3
Elective	3	Literature Requirement ⁴	3
	18		18

JUNIOR YEAR

AGEC 302 Economics of Farm Mgt	3	AGEC 309 Economics of Agric. Marketing	3
ECON 314 Inter. Economic Theory	3	Agriculture Requirement ⁵	6
EXST 462 Statistics Applied to Economics	3	Concentration	6
RS 301 Rural Sociology	3	Elective	3
Agriculture Requirement ⁵	3		18
Elective	3		
	18		

SENIOR YEAR

AGEC 402 Production Economics	3	AGEC 406 Seminar	1
LAW 322 Legal Environ. of Business	3	AGEC 456 Prices	3
Concentration	6	Concentration	6
Elective	3	Elective	6
	<u>15</u>		<u>16</u>

134 Total Semester Hours

¹A two-semester sequence from the College of Sciences in the same physical or biological science, each including a laboratory.
²ENGL 231, 304, 314, SPCH 250.
³A physical or biological science from the College of Sciences.
⁴ENGL 202, 203, 204, 205, 206, 207, 208, 209.
⁵Courses in the College of Agricultural Sciences not including those in the Department of Agricultural Economics and Rural Sociology.

COMMUNITY AND RURAL DEVELOPMENT

The Community and Rural Development curriculum is designed to provide students with training to deal with local, national, and international development issues. Students learn about agriculture, natural environments, and basic principles in several disciplines. Associations between natural resources and social, economic, and political institutions are studied. Students receive practical training, and internships are available to complement the coursework in this curriculum.

A bachelors degree with a major in Community and Rural Development will qualify students for employment with local, state, regional, and federal agencies; with utilities, cooperative-extension services, private businesses, research-consulting firms, and financial institutions. This major also provides an excellent background for professional or graduate study in several disciplines.

FRESHMAN YEAR

First Semester		Second Semester	
AGRIC 103 Intro. to Animal Industries	3	AGRIC 104 Intro. to Plant Sciences	3
AGRIC 105 Agriculture and Society	2	ENGL 102 Composition II	3
ENGL 101 Composition I	3	MTHSC 102 Intro. to Math. Analysis	3
HIST 102 History of the U.S.	3	POSC 201 Intro. to Gov't and Politics	3
MTHSC 101 Finite Probability	3	Science Requirement ¹	4
Science Requirement ¹	4		<u>16</u>
	<u>18</u>		

SOPHOMORE YEAR

AGEC 202 Agricultural Economics	3	ACCT 220 Basic Accounting	3
AGM 301 Soil and Water Conservation	3	AGEC 342 Public Finance	3
or AGRON 202 Soils	4	CPSC 110 Elementary Computer Prog.	3
or GEOL 400 Environmental Geology	3	or CPSC 120 Intro. to Inf. Proc. Sys.	3
ENGL 231 Intro. to Journalism	3	ECON 212 Principles of Economics	3
or ENGL 304 Business Writing	3	RS 301 Rural Sociology	3
or ENGL 314 Technical Writing	3	Literature Requirement ²	3
EXST 301 Introductory Statistics	3		<u>18</u>
Humanities Requirement ³	3		
Social Science Requirement ⁴	3		
	<u>18-19</u>		

JUNIOR YEAR

ECON 314 Inter. Economic Theory	3	CRD 357 Natural Resources Economics	3
RS (SOC) 359 The Community	3	RS (SOC) 401 Human Ecology	3
SPCH 250 Public Speaking	3	Advanced Economics Requirement ⁶	3
Minor ⁵	3	Advanced Social Science Requirement ⁷	3
Elective	4	Minor ⁵	4
	<u>16</u>		<u>16</u>

SENIOR YEAR

CRD (AGEC) 411 Reg. Impact Analysis	2	AGEC 403 Land Economics	3
EXST 462 Statistics Applied to Econ.	3	CRD (AGEC) 412 Spatial Competition	
RS (SOC) 471 Demography	3	and Rural Development	2
Minor ⁵	2	Advanced Social Science Requirement ⁷	3
Planning Requirement ⁸	3	Minor ⁵	5
Elective	3	Elective	3
	16		16

134 Total Semester Hours

¹A two-semester sequence from the College of Sciences in the same physical or biological science, each including a laboratory

²ENGL 202, 208, 209

³Select from drama, foreign language, humanities, music, philosophy.

⁴GEOG 101, 102, 302; or SOC (RS) 303.

⁵See adviser for available minors and course requirements.

⁶ECON 302, 407, 421; or MGT 405.

⁷POSC 302, 321, 361, 423, 427, PSYCH 352; or SOC 380, SOC (RS) 371, 403

⁸CAPL 411, 415, 472

AGRICULTURAL EDUCATION

Agricultural Education provides broad preparation in agricultural sciences and professional education, including communications and human-relations skills. In addition to required courses, students may elect minor study in agricultural management, mechanization, horticulture, forestry, or production agriculture. Students in other departments within the College of Agriculture Sciences may minor in Agricultural Education and be certified to teach when they meet the minimum requirements.

The Bachelor's degree prepares students for professional education positions in the mainstream of agriculture including vocational agriculture, cooperative extension service, and governmental agricultural agencies such as SCS, FMHA, or ASCS. This degree prepares students for other forms of educational work such as agricultural missionary, public relations, and positions as training officers in agricultural industry, both domestic and international.

FRESHMAN YEAR

First Semester		Second Semester	
AGRIC 103 Intro. to Animal Ind.	3	AGED 100 Orientation and Field Exp.	1
BIOL 103 General Biology I	3	AGRIC 104 Intro. to Plant Sciences	3
BIOL 105 General Biology Lab. I	1	BIOL 104 General Biology II	3
CH 101 General Chemistry	4	BIOL 106 General Biology Lab. II	1
ENGL 101 Composition I	3	CH 102 or 112 General Chemistry	4
HIST 191 The World in the 20th Century	3	ENGL 102 Composition II	3
	17	Elective	1
			16

SOPHOMORE YEAR

AGEC 202 Agricultural Economics	3	AGM 205 Principles of Farm Shop	3
AGED 201 Intro. to Agric. Ed.	3	or AGM 206 Agric. Mech	3
AGRIC 200 Agricultural Applications		AGRON 202 Soils	4
of Microcomputers	3	FOR 305 Elements of Forestry	3
Humanities Requirement ¹	3	Literature Requirement ³	3
Mathematical Sciences Requirement ²	3	Mathematical Sciences Requirement ²	3
Elective	1		16
	16		

JUNIOR YEAR

AGEC 302 Econ. of Farm Management	3	ANSC 301 Feeds and Feeding	3
AGM 301 Soil and Water Conservation	3	ED 302 Educational Psychology	3
or AGM 452 Farm Power	3	ENGL 231 Intro. to Journalism	3
ENT 301 General Entomology	3	or ENGL 304 Business Writing	3
Minor ⁴	6	or SPCH 250 Public Speaking	3
Elective	3	Minor ⁴	6
	18	Elective	3
			18

SENIOR YEAR

AGED 400 Supv. Field Exp. II	1	AGED 406 Directed Teaching	12
AGED 401 Meth. in Agric. Education	3	AGED 423 Curriculum	2
HORT 407 Landscape Design	3	AGED 425 Teaching Agric. Mechanics	2
PLPA 301 Plant Pathology	3		16
Minor ⁴	3		
Elective	4		
	17		

134 Total Semester Hours

¹See Humanities section under General Education Requirements, page 53.²A minimum of 6 credits in mathematical sciences is required, excluding MTHSC 115, 116, 215, 216. EXST 301 may be included.³ENGL 202, 203, 204, 205, 206, 207, 208, 209.⁴See adviser for available minor areas and course requirements.**AGRICULTURAL ENGINEERING**

Graduates in Agricultural Engineering are well-equipped to apply engineering to many functions affecting the well-being of mankind. They have broad training in mathematics, physics, chemistry, and biological sciences as well as comprehensive coverage of the engineering sciences. Agricultural engineers are sought by industry and public service organizations primarily for their ability to apply engineering know-how to living systems and to the management of land and water resources. Specific areas of emphasis are as follows:

1. Agricultural Production and Consumer Products Engineering
2. Biotechnology Engineering
3. Food Engineering
4. Natural Resources Engineering

This major includes training in such engineering sciences as mechanics, fluids, thermodynamics, electrical theory, computing devices and systems analysis. Courses in the basic sciences as appropriate to the areas of emphasis provide a foundation for engineering design and development and for the management of biological systems. In addition, important facets of energy conversion, research methods, use of economy and integrity in design and protection, modification, and control of the environment are included.

Graduate programs lead to the Master of Science, Master of Engineering, and Doctor of Philosophy degrees.

Opportunities for employment of agricultural engineering graduates include design, research, production and sales with industry plus teaching, research, extension, and field engineering with state and federal agencies. Agricultural engineers are also equipped for self-employment as consulting engineers or as owners of businesses providing technical services and products.

FRESHMAN YEAR PROGRAM

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 102 or 112 General Chemistry ³	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
ENGR 180 Computers in Engineering ¹	3	ENGR 101 Introduction to Engineering ¹	1
MTHSC 106 Cal. of One Var. I	4	MTHSC 108 Cal. of One Var. II	4
Humanistic/Social Science Elective ²	3	PHYS 122 Physics with Calculus I	3
	17	Elective	3
			18

¹One-half of the entering freshman class will enroll during the first semester, the other one-half will enroll during the second semester.

²See Policy on Humanities and Social Sciences for Engineering curricula.

³See adviser.

AGRICULTURAL PRODUCTION AND CONSUMER PRODUCTS EMPHASIS

See Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
AGE 221 Survey. for Soil and Water Res	2	AGE 214 Fab. and Mfg. Meth. for Ag. Sys	2
EG 209 Intro. to Engr./Comp. Graphics	2	ECON 211 Principles of Economics ¹	3
EM 201 Engr. Mechanics: Statics	3	or ECON 200 Economic Concepts ¹	3
MTHSC 206 Calculus of Sev. Var.	4	EM 202 Engr. Mechanics: Dynamics	3
PHYS 221 Phys. with Cal. II	3	MTHSC 208 Intro. to Ord. Diff. Equa.	4
PHYS 223 Physics Lab. II	1	PHYS 222 Physics with Cal. III	3
Elective	3	Literature Requirement ¹	3
	18		18

JUNIOR YEAR

AGE 356 Mach. Op. for Ag. and Biol. Sys	3	AGE 322 Small Watershed Hyd. and Sed.	2
ECE 307 Basic Electrical Engineering	2	AGE 333 Environ. Mod. and Cont. for Agric. and Biological Systems	2
ECE 309 Elec. Engr. Lab. I	1	AGE 350 Microcomp. Controls in Biosys.	2
EM 304 Mechanics of Materials	3	AGE 362 Energy Conv. in Ag. and Biol. Sys.	3
ME 310 Thermodynamics and Heat Transfer	3	AGRON 202 Soils	4
Mathematics Elective ¹	3	EM 320 Fluid Mechanics	3
Plant/Animal Science Elective ¹	3	ENGL 314 Technical Writing ¹	3
	18	or SPCH 250 Public Speaking ¹	3
			19

SENIOR YEAR

AGE 416 Mech. Des. for Ag. and Biol. Sys.	3	AGE 421 Engr. Sys. for Soil Water Mgt	2
AGE 450 Instru. for Ag. and Biol. Sys.	3	AGE 431 Agric. Struc. and Environ. Des.	3
AGE 471 Engr. Research and Management	2	AGE 442 Prop. and Proc. of Biol. Prod	3
IE 384 Engineering Economic Analysis	3	Humanistic/Social Elective ²	3
ME (AGE) 452 Safety Engineering	3	Technical Elective ¹	3
Humanistic/Social Elective	3	Elective	4
	17		18

143 Total Semester Hours

¹See adviser

²See Policy on Humanities and Social Sciences for Engineering Curricula.

BIOTECHNOLOGY ENGINEERING EMPHASIS

See Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
CH 201 Organic Chemistry	4	AGE 214 Fab. and Mfg. Meth. for Ag. Sys	2
EG 209 Intro. to Engr./Comp. Graphics	2	BIOCH 301 General Biochemistry	3
EM 201 Engr. Mechanics: Statics	3	BIOCH 302 Molecular Biology Lab	1
MTHSC 206 Calculus of Sev. Var.	3	EM 202 Engr. Mechanics: Dynamics	3
PHYS 221 Phys. with Cal. II	4	MTHSC 208 Intro. to Ord. Diff. Equa.	4
PHYS 223 Physics Lab. II	1	PHYS 222 Physics with Cal. III	3
Elective	1	Elective	2
	18		18

JUNIOR YEAR

AGE (BIOSC) 430 Bioenergetics for Engr.	4	AGE 333 Environ. Mod. and Cont. for Agric. and Biological Systems	2
ECE 307 Basic Electrical Engineering	2	AGE 350 Microcomp. Controls in Biosys.	2
ECE 309 Elec. Engr. Lab. I	1	AGE 362 Energy Conv. in Ag. and Biol. Sys.	3
EM 304 Mechanics of Materials	3	EM 320 Fluid Mechanics	3
ME 310 Thermodynamics and Heat Transfer	3	ENGL 314 Technical Writing ¹	3
Literature Requirement ¹	3	or SPCH 250 Public Speaking ¹	3
Mathematics Elective ¹	3	MICRO 305 General Microbiology	4
	19	Elective	2
			19

SENIOR YEAR

AGE 416 Mech. Des. for Ag. and Biol. Sys.	3	AGE 421 Engr. Sys. for Soil Water Mgt	2
AGE 450 Instru. for Ag. and Biol. Sys.	3	AGE 429 Appl. in Biotech. Engr.	3
AGE 471 Engr. Research and Management	2	AGE 442 Prop. and Proc. of Biol. Prod	3
BIOSC 461 Cell Biology	4	ECON 211 Principles of Economics ¹	3
CHE (AGE) 428 Biochemical Engineering	3	or ECON 200 Economic Concepts ¹	3
Humanistic/Social Elective ²	3	Humanistic/Social Elective ²	3
	18	Elective	2
			16

143 Total Semester Hours

¹See adviser.²See Policy on Humanities and Social Sciences for Engineering Curricula**FOOD ENGINEERING EMPHASIS**

See page 59 for Freshman year.

SOPHOMORE YEAR**First Semester**

CH 201 Organic Chemistry	4
EG 209 Intro. to Engr./Comp. Graphics	2
EM 201 Engr. Mechanics: Statics	3
MTMSC 206 Calculus of Sev. Var.	4
PHYS 221 Phys. with Cal. II	3
PHYS 223 Physics Lab. II	1
Elective	1
	18

Second Semester

AGE 214 Fab. and Mfg. Meth. for Ag. Sys	2
BIOCH 301 General Biochemistry	3
BIOCH 302 Molecular Biology Lab	1
EM 202 Engr. Mechanics: Dynamics	3
MTMSC 208 Intro. to Ord. Diff. Equa.	4
PHYS 222 Physics with Cal. III	3
Elective	2
	18

JUNIOR YEAR

AGE (BIOSC) 430 Bioenergetics for Engr.	4	AGE 333 Environ. Mod. and Cont. for Agric. and Biological Systems	2
ECE 307 Basic Electrical Engineering	2	AGE 350 Microcomp. Controls in Biosys.	2
ECE 309 Elec. Engr. Lab. I	1	AGE 362 Energy Conv. in Ag. and Biol. Sys.	3
ECON 211 Principles of Economics ¹	3	EM 320 Fluid Mechanics	3
or ECON 200 Economic Concepts ¹	3	ENGL 314 Technical Writing ¹	3
EM 304 Mechanics of Materials	3	or SPCH 250 Public Speaking ¹	3
ME 310 Thermodynamics and Heat Transfer	3	MICRO 305 General Microbiology	4
Literature Requirement ¹	3	Elective	2
	19		19

SENIOR YEAR

AGE 416 Mech. Des. for Ag. and Biol. Sys.	3	AGE 429 Appl. in Biotech. Engr.	3
AGE 450 Instru. for Ag. and Biol. Sys.	3	AGE 442 Prop. and Proc. of Biol. Prod.	3
AGE 471 Engr. Research and Management	2	MICRO 407 Food and Dairy Microbiology	4
CHE (AGE) 428 Biochemical Engineering	3	Approved Engineering Elective ¹	1
FDSC 401 Food Chemistry I	4	Humanistic/Social Elective ²	3
Humanistic/Social Elective ²	3	Elective	2
	18		16

143 Total Semester Hours

¹See adviser.²See Policy on Humanities and Social Sciences for Engineering Curricula.

NATURAL RESOURCES ENGINEERING EMPHASIS

See page 59 for Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
AGE 221 Survey. for Soil and Water Res	2	AGE 214 Fab. and Mfg. Meth. for Ag. Sys	2
EG 209 Intro. to Engr./Comp. Graphics	2	ECON 211 Principles of Economics ¹	3
EM 201 Engr. Mechanics: Statics	3	or ECON 200 Economic Concepts ¹	3
MTHSC 206 Calculus of Sev. Var.	4	EM 202 Engr. Mechanics: Dynamics	3
PHYS 221 Phys. with Cal. II	3	MTHSC 208 Intro. to Ord. Diff. Equa.	4
PHYS 223 Physics Lab. II	1	PHYS 222 Physics with Cal. III	3
Elective	3	Literature Requirement ¹	3
	18		18

JUNIOR YEAR

AGE 356 Mach. Op. for Ag. and Biol. Sys	3	AGE 322 Small Watershed Hyd. and Sed.	2
ECE 307 Basic Electrical Engineering	2	AGE 333 Environ. Mod. and Cont. for Agric.	
ECE 309 Elec. Engr. Lab. I	1	and Biological Systems	2
EM 304 Mechanics of Materials	3	AGE 350 Microcomp. Controls in Biosys.	2
ME 310 Thermodynamics and Heat Transfer	3	AGE 362 Energy Conv. in Ag. and Biol. Sys.	3
Biological Science Elective ¹	4	AGRON 202 Soils	3
Mathematics Elective ¹	3	EM 320 Fluid Mechanics	3
	19	ENGL 314 Technical Writing ¹	3
		or SPCH 250 Public Speaking ¹	3
			19

SENIOR YEAR

AGE 416 Mech. Des. for Ag. and Biol. Sys.	3	AGE 364 Agric. Waste- Mgt. Sys.	2
AGE 450 Instru. for Ag. and Biol. Sys.	3	AGE 421 Engr. Sys. for Soil Water Mgt.	2
AGE 471 Engr. Research and Management	2	AGE 431 Agric. Struc. and Environ. Des.	3
Approved Engineering Elective ¹	3	Humanistic/Social Elective ²	3
Humanistic/Social Elective ²	3	Humanistic Elective ¹	3
Science Elective ¹	3	Elective	4
	17		17

143 Total Semester Hours

¹See adviser

²See Policy on Humanities and Social Sciences for Engineering Curricula

AGRICULTURAL MECHANIZATION AND BUSINESS

The major in Agricultural Mechanization and Business is designed to provide an educational program for undergraduate students who desire training in areas which are relevant to dynamic agricultural enterprise. It is organized with strength both in the business management area and in nonengineering type support of technical agriculture and agribusiness concepts. In order to produce an individual who is well rounded and capable of communicating, the curriculum includes courses in the humanities, social sciences, English composition, and public speaking.

The graduate in agriculture with a major in Agricultural Mechanization and Business finds meaningful and remunerative employment in a variety of situations directly and indirectly related to agricultural production, processing, marketing, and the many services connected therewith.

FRESHMAN YEAR

First Semester		Second Semester	
AGRIC 103 Intro. to Animal Industries	3	AGRIC 104 Intro. to Plant Science	3
BIOL 103 General Biology I	3	BIOL 104 General Biology II	3
BIOL 105 General Biology Lab. I	1	BIOL 106 General Biology Lab. II	1
CH 101 General Chemistry	4	CH 102 or 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
Mathematics Requirement ¹	3	Mathematics Requirement ¹	3
	17		17

SOPHOMORE YEAR

AGEC 202 Agricultural Economics	3	ACCT 201 Principles of Accounting	3
AGM 205 Principles of Farm Shop	3	AGM 206 Agricultural Mechanization	3
AGRIC 200 Agric. Appl. of Microcomp.	3	PHYS 208 General Physics II	4
EG 109 Engineering Graphics	2	Economics Requirement ⁴	3
PHYS 207 General Physics I	4	Social Science Requirement ³	3
Literature Requirement ²	3		16
	18		

JUNIOR YEAR

AGEC 302 Econ. of Farm Management	3	AGEC 309 Econ. of Agric. Marketing	3
AGEC 351 Agricultural Sales, Merchandising, and Advertising	3	AGM 402 Drainage, Irrigation, and Waste Management	3
or AGECE 352 Public Finance	3	AGM 406 Mech. and Hydraulic Systems	3
AGM 302 Rainfall, Runoff, and Erosion Control	3	AGRON 202 Soils	4
AGM 303 Cal. for Mech. Agric.	3	ENGL 231 Intro. to Journalism	3
Social Science Requirement ³	3	or ENGL 304 Business Writing	3
Elective	3	SPCH 250 Public Speaking	3
	18		19

SENIOR YEAR

AGEC 319 Agribusiness Management	3	AGM 404 Farm Structure	3
or AGECE 409 Commodity Futures Market	3	AGM 408 Equip. Sales and Service	3
AGM 452 Farm Power	3	Agriculture Requirement ⁴	3
AGM 460 Farm and Home Utilities	3	Elective	7
AGM 472 Seminar	1		16
Economics Requirement ⁴	3		
Humanities Requirement ⁵	3		
	16		

137 Total Semester Hours

¹A minimum of 6 credits to be selected from MTHSC 102, 105, 106.²ENGL 202, 203, 204, 205, 206, 207, 208, 209³Select from ED 302, GEOG 101, 301, 302, HIST 101, 102, 172, 173, PHIL 101, 325, POSC 101, PSYCH 201, RS (SOC) 401, SOC 201, or any agricultural economics and rural sociology courses⁴See adviser.⁵See General Education Requirement.**AGRONOMY**

The science of Agronomy is the application of basic science such as chemistry, microbiology, physics, botany, and genetics to food and fiber crop production systems. The agronomic crops account for the bulk of the primary agricultural production in the United States and the world. Career opportunities for Agronomy majors exist beyond those usually associated with traditional agriculture. A degree in Agronomy can be an entry into environmental sciences, biotechnology, international agriculture, genetic engineering, and the new high-tech world of agriculture.

The degree in Agronomy can lead to a job in industry, government, or business. It can also be a stepping stone to graduate work and a career in research. Because the Agronomy curriculum is a combination of basic and applied sciences, it provides flexibility not found in other areas.

Students majoring in Agronomy will select from three study areas: Agronomic Systems, Soil and Environment, and Weed Science.

AGRONOMIC SYSTEMS STUDY AREA

This study area provides a comprehensive agronomy curriculum which can prepare the student for a career in crop consulting, extension education, farm management, and industries requiring a knowledge of agricultural or managed ecosystems. It will also prepare the

student for graduate work in one of the crop-related areas such as crop physiology, plant breeding and genetics, crop management, plant-soil-environment relationships, and soil fertility.

FRESHMAN YEAR

First Semester		Second Semester	
AGRIC 103 Intro. to Animal Ind.	3	AGEC 202 Agricultural Economics	3
CH 101 General Chemistry	4	AGRIC 104 Intro. to Plant Sciences	3
ENGL 101 Composition I	3	CH 112 General Chemistry	4
MTHSC 102 Intro. to Math. Analysis	3	ENGL 102 Composition II	3
or MTHSC 106 Calculus of One Var. I	3	EXST 301 Introductory Statistics	3
Social Science Requirement ¹	3	or MTHSC 108 Cal. of One Var. II	4
	16-17	or MTHSC 207 Multivariable Calculus	3
			16-17

SOPHOMORE YEAR

AGRON 202 Soils	4	AGRIC 200 Agric. Appl. of Microcomputer	3
BIOL 103 General Biology I	3	BOT 205 Plant Form and Function	4
BIOL 105 General Biology Lab. I	1	PHYS 200 Introductory Physics	4
CH 223 Organic Chemistry	3	Humanities Requirement ¹	3
and CH 227 Organic Chemistry Lab.	1	Elective	3
or BIOCH 210 Elementary Biochemistry	4		17
Literature Requirement ⁶	3		
Elective	3		
	18		

JUNIOR YEAR

BOT 421 Plant Physiology	4	AGRON 424 Adv. Field Crops Lab	1
GEN 302 Introductory Genetics	4	AGRON 452 Soil Fertility and Management	3
SPCH 250 Public Speaking	3	Agronomy Elective ⁴	6
Crop Production Requirement ²	3	Crop Production Requirement ²	3
Pest Management Requirement ³	3	Pest Management Requirement ³	3
	17		16

SENIOR YEAR

AGRON 455 Seminar	1	AGRON 456 Seminar	1
ENGL 314 Technical Writing	3	BIOSC 441 Ecology	4
Agronomic Specialty Requirement ⁵	3	Agronomic Specialty Requirement ⁵	3
Agronomy Elective ⁴	5	Agronomy Elective ⁴	3
Elective	4	Elective	6
	16		17

133-135 Total Semester Hours

¹See General Education Requirements

²Select at least two of the following: AGRON 421, 422, 423

³Select at least two courses from the following: AGRON 407, ENT 301, PLPA 301

⁴Select at least 14 credits from the following: AGRON 403, 405, 407, 421, 422, 423, 425, 433, 446, 453, 475, 490, ENT 301, PLPA 301, and no more than 3 hours from AGRON 350 or 406.

⁵Select at least two of the following: AGRON 405, 425, 490

⁶ENGL 202, 203, 204, 205, 206, 207, 208, 209

SOIL AND ENVIRONMENT STUDY AREA

This study area gives students an understanding of soil as a natural resource and as a component of all terrestrial ecosystems. The student will learn how soils influence ecological processes which take place above and below the ground. An understanding of these processes will enable the student to deal with traditional agricultural production issues as well as environmental management problems such as groundwater protection and the most appropriate use for a particular landscape. The student can aim toward a variety of special areas including soil biology, fertility, chemistry, physics, mineralogy, and morphology.

FRESHMAN YEAR

First Semester		Second Semester	
AGRIC 103 Intro. to Animal Industries	3	AGRIC 104 Intro. to Plant Sciences	3
CH 101 General Chemistry	4	CH 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Cal. of One Var. I ¹	4	MTHSC 108 Cal. of One Var. II ¹	4
Social Science Requirement ²	3	Humanities Requirement ³	3
	17		17

SOPHOMORE YEAR

AGRON 202 Soils	4	BOT 205 Plant Form. and Function	4
BIOL 103 General Biology I	3	CH 224 Organic Chemistry	3
BIOL 105 General Biology Lab. I	1	and CH 228 Organic Chemistry Lab.	1
CH 223 Organic Chemistry	3	or BIOCH 210 Elementary Biochemistry	4
and CH 227 Organic Chemistry Lab.	1	GEOL 101 Physical Geology	3
or CH 201 Survey of Organic Chemistry	4	GEOL 103 Physical Geology Lab.	1
PHYS 207 General Physics ⁴	4	PHYS 208 General Physics ⁴	4
	16	Literature Requirement ⁶	3
			19

JUNIOR YEAR

AGRON 421 Field Crops—Monocots	3	AGRON 452 Soil Fertility and	
or AGRON 422 Field Crops—Dicots	3	Management	3
or AGRON 423 Field Crops—Forages	3	AGRON 453 Soil Fertility Lab.	1
BOT 421 Plant Physiology	4	MICRO 305 General Microbiology	4
CH 313 Quantitative Analysis	3	SPCH 250 Public Speaking	3
CH 315 Quantitative Analysis Lab.	2	Social Science Requirement ²	3
GEN 302 Introductory Genetics	4	Elective	3
	16		17

SENIOR YEAR

AGRON 403 Soil Genesis and		AGRIC 200 Agric. Appl. of	
Classification	2	Microcomputers ⁷	3
AGRON 446 Soil Management	3	AGRON 456 Seminar	1
AGRON 455 Seminar	1	AGRON 475 Soil Physics and Chemistry	3
AGRON 490 Soil Organisms in Crop Prod.	3	BIOSC 441 Ecology ⁵	4
ENGL 314 Technical Writing	3	Elective	6
Elective	4		17
	16		

135 Total Semester Hours

¹MTHSC 102 and 207 may be taken in lieu of MTHSC 106 and 108
²See General Education Requirements; must include 3 hours of agricultural economics or economics.
³See General Education Requirements
⁴PHYS 122, 124, 221, 223 may be substituted.
⁵Other approved ecology courses may be substituted (See adviser.)
⁶ENGL 202, 203, 204, 205, 206, 207, 208, 209
⁷CPSC 110 can be substituted.

WEED SCIENCE STUDY AREA

This study area is designed for those who have special interest in the agricultural chemical industry, in consulting where weed control is to be the area of specialization, and in research and extension education. Courses include plant physiology, pathology, entomology, and pesticide toxicology and provides a broad education in pest control.

The student who is interested in graduate work can plan for specialization in such areas as weed physiology, ecology, and control or herbicide technology.

FRESHMAN YEAR

First Semester		Second Semester	
AGRIC 103 Intro. to Animal Industries	3	AGEC 202 Agricultural Economics	3
CH 101 General Chemistry	4	AGRIC 104 Intro. to Plant Sciences	3
ENGL 101 Composition I	3	CH 112 General Chemistry	4
MTHSC 102 Intro. to Math. Analysis	3	ENGL 102 Composition II	3
or MTHSC 106 Cal. of One Var. I	4	EXST 301 Introductory Statistics	3
Social Science Requirement ¹	3	or MTHSC 108 Cal. of One Var. II	4
	16-17	or MTHSC 207 Multivariable Calculus	3
			16-17

SOPHOMORE YEAR

AGRON 202 Soils	4	AGRIC 200 Agric. Appl. of Microcomputers	3
BIOL 103 General Biology I	3	BOT 205 Plant Form. and Function	4
BIOL 105 General Biology Lab. I	1	PHYS 200 Introductory Physics	4
CH 223 Organic Chemistry	3	Humanities Requirement ¹	3
and CH 227 Organic Chem. Lab.	1	Elective	3
or BIOCH 210 Elem. Biochemistry	4		17
Literature Requirement ²	3		
Elective	3		
	18		

JUNIOR YEAR

AGRON 421 Field Crops—Monocots	3	AGRON 422 Field Crops—Dicots	3
AGRON 490 Soil Organisms and Crop. Prod.	3	AGRON 424 Adv. Field Crops Lab.	1
BOT 431 Intro. to Plant Taxonomy	4	AGRON 452 Soil Fert. and Management	3
GEN 302 Introductory Genetics	4	ENT 301 General Entomology	3
SPCH 250 Public Speaking	3	PLPA 301 Plant Pathology	3
	17	Agronomy Requirement ³	3
			16

SENIOR YEAR

AGRON 407 Principles of Weed Control	3	AGRON (HORT) 433 Integrated Weed Mgt.	3
AGRON 446 Soil Management	3	AGRON 456 Seminar	1
AGRON 455 Seminar	1	ENGL 314 Technical Writing	3
BIOSEC 441 Ecology	4	ENT 420 Toxicology of Insecticides	3
BOT 421 Plant Physiology	4	Agronomy Requirement ³	3
Elective	3	Elective	3
	18		16

134-136 Total Semester Hours

¹See General Education Requirement.²ENGL 202, 203, 204, 205, 206, 207, 208, 209.³AGRON 423, HORT 352, 407, 412, 456.**ANIMAL INDUSTRIES**

The Animal Industries major includes three curricula—Animal Science, Dairy Science, and Poultry Science.

ANIMAL SCIENCE MAJOR

The curriculum in Animal Science exposes the student to a broad base of sciences, humanities, and specialized knowledge of the principles involved in livestock production, marketing and processing. Scientific principles and the applications of these principles are stressed. The curriculum is divided into four emphasis areas: Business and Production, Communication, Meat Industry, and Preveterinary Science. Each emphasis area includes its own specialized courses as well as general education courses required by the University and core animal science courses. Free and approved electives are included so each student can select courses based on their individual interests. Courses for the freshman year are common to all emphasis areas.

Many career opportunities are available to Animal Science graduates. Some examples include sales, marketing, business management, production, journalism, advertising, extension, meat grading and inspection, teaching and research. Graduates can also pursue advanced degrees in graduate schools or veterinary medicine.

FRESHMAN YEAR

First Semester		Second Semester	
ANSC 202 Introductory Animal Science	3	ANSC 108 Animal Science Techniques I	1
BIOL 110 Principles of Biology I	5	BIOL 111 Principles of Biology II	5
or BIOL 103 General Biology I	3	or BIOL 104 General Biology II	3
and BIOL 105 General Biology Lab. I	1	and BIOL 106 General Biology Lab. II	1
CH 101 General Chemistry	4	CH 102 or 112 General Chemistry ¹	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
	14-15	Mathematics Requirement ²	3
			15-16

BUSINESS AND PRODUCTION EMPHASIS

See Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
ANSC 203 Financial Accounting	3	AGRIC 200 Agricultural Applications	
AGEC 202 Agricultural Economics	3	of Microcomputers	3
ANSC 210 Animal Science Techniques II	1	ANPH 301 Physiology and Anatomy	
Humanities Requirement ³	3	of Domestic Animals	4
Mathematics Requirement ²	3	ANSC 253 Meats	2
Approved Elective ⁷	3	ANSC 255 Meats Lab	1
	16	Humanities Requirement ³	3
		Plant or Soils Science Requirement ⁴	3
		Approved Elective ⁷	3
			19

JUNIOR YEAR

AGEC 302 Economics of Farm Manage.	3	ANSC 302 Prin. of Livestock Selection	2
or AGECE 319 Agribusiness Management	3	FIN 306 Corporation Finance	3
ANSC 301 Feeds and Feeding	3	MGT 301 Principles of Management	3
DYSC 453 Animal Reproduction	3	MKT 301 Principles of Marketing	3
MGT 200 Introduction to Business	3	Emphasis Area Requirement ⁵	3
NUTR 401 Fundamentals of Nutrition	3	Approved Elective ⁷	3
SPCH 250 Public Speaking	3		17
	18		

SENIOR YEAR

ANSC 409 Commodity Futures Markets	3	ANSC 452 Animal Breeding	3
ANSC 406 Seminar	2	Animal Production Requirement ⁶	4
Animal Production Requirement ⁶	4	Approved Elective ⁷	3
Emphasis Area Requirement ⁵	3	Elective	7
Approved Elective ⁷	3		17
Elective	3		
	18		

134 Total Semester Hours

See footnotes, page 68.

COMMUNICATION EMPHASIS

See Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
AGEC 202 Agricultural Economics	3	AGRIC 200 Agricultural Applications	
or ECON 211 Principles of Econ.	3	to Microcomputers	3
ANSC 210 Animal Science Techniques II	1	ANPH 301 Physiology and Anatomy	
ENGL 231 Introduction to Journalism	3	of Domestic Animals	4
GC 104 Graphic Arts I	3	ANSC 253 Meats	2
PHIL 102 Introduction to Philosophy	3	ANSC 255 Meats Lab	1
Mathematics Requirement ²	3	ENGL 312 Advanced Expository Writing	3
Approved Elective ⁷	3	Plant or Soil Science Requirement ⁴	3
	19		16

JUNIOR YEAR

AGEC 302 Economics of Farm Manage.	3	ANSC 302 Prin. of Livestock Selection	2
or AGECE 319 Agribusiness Manage.	3	MKT 301 Principles of Marketing	3
ANSC 301 Feeds and Feeding	3	SPCH 360 Persuasion	3
DYSC 453 Animal Reproduction	3	or SPCH 361 Argumentation	3
ENGL 333 Reporting for News Media	3	Approved Elective ⁷	5
or ENGL 334 Feature Writing	3	Elective	4
NUTR 401 Fundamentals of Nutrition	3		17
SPCH 250 Public Speaking	3		
	18		

SENIOR YEAR

AGEC 309 Economics of Agricultural Mkt.	3	AGED 432 Visual Media for Agribusiness	3
or AGECE 351 Agric. Sales, Merc. and Adv.	3	ANSC 452 Animal Breeding	3
ANSC 406 Seminar	2	Animal Production Requirement ⁶	4
Animal Production Requirement ⁶	4	Approved Elective ⁷	3
Emphasis Area Requirement ⁸	3	Elective	6
Approved Elective ⁷	4		19
	16		

134 Total Semester Hours

See footnotes, page 68

MEAT INDUSTRY EMPHASIS

See page 66 for Freshman year.

SOPHOMORE YEAR**First Semester**

ANSC 210 Animal Science Techniques II	1
BIOCH 210 Elementary Biochemistry	4
PKGSC 102 Intro. to Packaging Science	2
Humanities Requirement ³	3
Mathematics Requirement ²	3
Plant or Soil Science Requirement ⁴	3
	16

Second Semester

AGEC 202 Agricultural Economics	3
or ECON 211 Principles of Economics	3
ANPH 301 Phys. and Anat. of Dom. Animals	4
ANSC 253 Meats	2
ANSC 255 Meats Lab	1
AGRIC 200 Agric. App. of Microcomputers	3
PHYS 200 Introduction to Physics	4
	17

JUNIOR YEAR

ANSC 301 Feeds and Feeding	3	ANSC 302 Prin. of Livestock Selection	2
ANSC 365 Biology of Muscle Growth	2	ANSC 380 Meat Technology and Fabric.	3
DYSC 453 Animal Reproduction	3	Emphasis Area Requirement ⁹	6
NUTR 401 Fundamentals of Nutrition	3	Humanities Requirement ³	3
SPCH 250 Public Speaking	3	Elective	3
Social Science Requirement ³	3		17
	17		

SENIOR YEAR

ANSC 406 Seminar	2	ANSC 452 Animal Breeding	3
FDSC 401 Food Chemistry I	4	Animal Production Requirement ⁶	4
FDSC 403 Food Pres. and Process. I	3	Approved Elective ⁷	8
FDSC 405 Food Pres. and Proc. Lab I	1	Elective	3
Animal Production Requirement ⁶	4		18
Elective	4		
	18		

134 Total Semester Hours

See footnotes, page 68

PREVETERINARY AND SCIENCE EMPHASIS

See page 66 for Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
ANSC 210 Animal Science Techniques II	1	ANPH 301 Physiology and Anat. of Dom. Ani.	4
CH 223 Organic Chemistry	3	ANSC 253 Meats	2
CH 227 Organic Chemistry Lab	1	ANSC 255 Meats Lab	1
MTHSC 102 Intro. to Math. Analysis	3	CH 224 Organic Chemistry	3
or MTHSC 106 Cal. of One Var. I	4	CH 228 Organic Chemistry Lab	1
PHYS 207 General Physics I	4	PHYS 208 General Physics II	4
Humanities Requirement ³	3	Social Science Requirement ³	3
	15-16		18

JUNIOR YEAR

ANSC 301 Feeds and Feeding	3	AGRIC 200 Agric. Appl. of Microcomputers	3
DYSC 453 Animal Reproduction	3	ANSC 302 Principles of Livestock Sel.	2
MICRO 305 General Microbiology	4	BIOCH 210 Elementary Biochemistry	4
NUTR 401 Fundamentals of Nutrition	3	or BIOCH 301 General Biochemistry ¹⁰	3
SPCH 250 Public Speaking	3	Humanities Requirement ³	3
Plant or Soil Science Requirement ⁴	3	Zoology Elective ¹¹	3
	19		14-15

SENIOR YEAR

ANSC 406 Seminar	2	ANSC 452 Animal Breeding	3
Animal Production Requirement ⁶	4	Animal Production Requirement ⁶	4
Social Science Requirement ³	3	Approved Elective ⁷	8
Approved Elective ⁷	3	Elective	4
Elective	6		19
	18		

134 Total Semester Hours

¹CH 112 is required for the Preveterinary and Science Emphasis Area.²Select from mathematics courses or EXST 301 as approved by adviser. North Carolina State Veterinary School requires MTHSC 102 or 106 and EXST 301.³Select from courses fulfilling General Education requirements.⁴AGRIC 104, AGRON 202 or 423.⁵Six hours of 300-400 level courses from any one of the following: agricultural economics, economics, finance, management, or marketing. Courses already required in this curriculum may not be used to satisfy this requirement.⁶ANSC 401, 408, 412, DYSC 452, PS 402/403.⁷Select in consultation with Animal Science adviser.⁸Select three hours from the following: ENGL 314, 333, 334, 390, 490, GC 207 and 304 or PSYCH 330. Courses already required in this curriculum may not be used to satisfy this requirement.⁹FDSC 402, 404, 406, 422, 424, 466, PKGSC 200, 420, 454.¹⁰North Carolina State Veterinary School requires BIOCH 301.¹¹Select from zoology courses at the 200 level or above. North Carolina State Veterinary School requires GEN 302 and ZOOL 301.**DAIRY SCIENCE MAJOR**

The curriculum in Dairy Science is designed to provide the student with an understanding of scientific principles and the application of these principles in the scientific, technical, and business phases of the dairy industry. Completion of required studies in the sciences and humanities and selected courses by the student in areas of personal interest prepares the graduate for a successful chosen profession. A career in the dairy industry is a rewarding one, not only monetarily, but in rendering a service in providing a wholesome, nutritious food for mankind.

Opportunities for dairy science graduates are many. They include the management of production and processing facilities, quality control work for processing units and production organizations, industrial promotion and public relations work in both production and processing fields, dairy and food products engineering, special services, public health service, teaching and research. Special service opportunities are

available in state and national breed association work, breeding organizations, industrial supplies, production and processing equipment and supplies. Opportunities in educational activities include positions with industrial associations, state and federal services and federal programs with foreign assignments.

Students majoring in Dairy Science may emphasize either Production or Manufacturing with sufficient electives to enhance their individual programs.

FRESHMAN YEAR

First Semester		Second Semester	
AGRIC 104 Intro. to Plant Sciences	3	BIOL 104 General Biology II	3
BIOL 103 General Biology I	3	BIOL 106 General Biology Lab. II	1
BIOL 105 General Biology Lab. I	1	CH 112 General Chemistry	4
CH 101 General Chemistry	4	DYSC 101 Dairy Foods	1
ENGL 101 Composition I	3	or DYSC 102 Mammalian Reproduction	1
MTHSC 102 Intro. to Math. Analysis ¹	3	ENGL 102 Composition II	3
	17	MTHSC 101 Finite Probability ¹	3
		Social Science Requirement ²	3
			18

SOPHOMORE YEAR

AGEC 202 Agricultural Economics	3	ANSC 202 Introductory Animal Science	3
CH 223 Organic Chemistry	3	MICRO 305 General Microbiology	4
and CH 227 Org. Chem. Lab.	1	Humanities Requirement ²	3
or BIOCH 210 Elem. Biochemistry	4	Science Requirement ⁵	3-4
DYSC 201 Intro. to Dairy Science	3	Elective	3-4
DYSC 203 Dairy Science Techniques	1		17
PS 201 Poultry Husbandry	3		
Literature Requirement ³	3		
	17		

MANUFACTURING OPTION

JUNIOR YEAR

First Semester		Second Semester	
ACCT 200 Basic Accounting	3	AGEC 309 Econ. of Agric. Marketing	3
or ACCT 201 Prin. of Accounting	3	DYSC 304 Evaluation of Dairy Products	2
DYSC 407 Market Milk	3	FDSC 422 Qual. Assurance and Sens. Eval.	2
GEN 302 Introductory Genetics	4	FDSC 424 Qual. Assurance and Sens. Eval. Lab	1
Communication Requirement ⁴	3	MICRO 407 Food and Dairy Micro	4
Elective ⁶	3	Elective ⁶	4
	16		16

SENIOR YEAR

DYSC 402 Dairy Manufactures	3	DYSC 400 Cultured Dairy Products	3
DYSC 409 Dairy Science Seminar	2	DYSC 404 Plant Management	2
DYSC 461 Physiology of Lactation	2	Elective ⁶	11
NUTR 401 Fundamentals of Nutrition	3		16
Elective	7		
	17		

134 Total Semester Hours

PRODUCTION OPTION

JUNIOR YEAR

First Semester		Second Semester	
AGRON 202 Soils	4	AGRON 423 Field Crops—Forages	3
ANSC 301 Feeds and Feeding	3	or AGECE 302 Econ. of Farm Mgt.	3
DYSC 407 Market Milk	3	ANPH 301 Physiology and Anatomy of Domestic Animals	4
GEN 302 Introductory Genetics	4	DYSC 310 Dairy Cattle Evaluation	1
Elective	2	Communication Requirement ⁴	3
	16	Elective	6
			17

SENIOR YEAR

DYSC 409 Dairy Science Seminar	2	ANSC 452 Animal Breeding	3
DYSC 453 Animal Reproduction	3	DYSC 452 Dairy Cattle Feeding and	
DYSC 455 Reproductive Management	1	Management	4
DYSC 461 Physiology of Lactation	2	Elective ⁶	9
NUTR 401 Fundamentals of Nutrition	3		16
Elective ⁶	6		
	17		

135 Total Semester Hours

¹Students may schedule 6 hours from MTHSC 105, 106, 108, 207, EXST 301 pursuant to satisfactory score on the College Board Achievement Test in Mathematics, Level II and as approved by adviser.

²ECON 200, 211, GEOG 101, 102, HIST 101, 102, 172, 173, POSC 201, PSYCH 201, RS (SOC) 359, 401, 471, SOC 201, 202.

³ENGL 202, 203, 204, 205, 206, 207, 208, 209.

⁴ENGL 231, 304, 312, 314, SPCH 250.

⁵Select from CPSC 110, 120, PHYS 122, 200, 207, or chemistry or biochemistry.

⁶At least 15 hours of elective credits must be in an area supporting the student's major. See adviser for available courses.

POULTRY SCIENCE MAJOR

This curriculum provides the student with a broad education in science and the humanities and specialized knowledge of the biology of the avian species and of the poultry industry. Avian science courses emphasize the nutrition, physiology, and pathology of domesticated and semi-domesticated birds. The environmental requirements for propagating the various species and for handling eggs and meat are covered.

Minors in Business, Environmental Science, International Agriculture, Production, Science or a Second Department provide for the student's specialized interests.

Job opportunities include supervisory positions with producers of eggs, broilers, turkeys, or game birds; technical representatives for feed manufacturers, vitamin and mineral suppliers, pharmaceutical and biological houses; extension specialists; teachers or researchers; salesmen or marketing specialists; quality control and poultry products technologists; government graders, inspectors or sanitarians.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	3	AGRIC 104 Intro. to Plant Sciences	3
BIOL 105 General Biology Lab. I	1	BIOL 104 General Biology II	3
CH 101 General Chemistry	4	BIOL 106 General Biology Lab. II	1
ENGL 101 Composition I	3	CH 112 General Chemistry	4
MTHSC 102 Intro. to Math. Analysis ¹	3	ENGL 102 Composition II	3
PS 101 Avian Pets	1	MTHSC 101 Finite Probability ¹	3
	15		17

SOPHOMORE YEAR

AGEC 202 Agricultural Economics	3	ANSC 202 Intro. Animal Science	3
or ECON 200 Economic Concepts	3	ENGL 231 Introduction to Journalism	3
or ECON 211 Principles or Economics	3	or ENGL 304 Business Writing	3
CH 223 Organic Chemistry ²	3	or ENGL 314 Technical Writing	3
and CH 227 Org. Chem. Lab.	1	MICRO 305 General Microbiology	4
or BIOCH 210 Elem. Biochem.	4	PHYS 200 Introductory Physics ⁴	4
or CH 201 Sur. of Org. Ch.	4	Humanities Requirement ⁵	3
DYSC 201 Intro. to Dairy Science	3		17
PS 201 Poultry Husbandry	3		
Literature Requirement ³	3		
Elective	2		
	18		

JUNIOR YEAR

ANSC 301 Feeds and Feeding	3	ANPH 301 Physiology and Anatomy	4
GEN 302 Introductory Genetics	4	of Domestic Animals	
SPCH 250 Public Speaking	3	PS 355 Poultry Products Grading and	3
Minor ⁷	3	Technology	3
Social Science Requirement ⁶	3	PS 402 Poultry Management	1
	16	PS 403 Poultry Management Lab	6
		Minor ⁷	17

SENIOR YEAR

MGT 301 Principles of Management	3	PS 400 Avian Physiology	3
PS 451 Poultry Nutrition	2	PS 454 Least Cost Feed Form	1
PS 453 Poultry Nutrition Lab.	1	PS 460 Seminar	1
PS 458 Avian Micro. and Parasitology	4	Minor ⁷	3
Minor ⁷	3	Elective	9
Elective	4		17
	17		

134 Total Semester Hours

¹Students may schedule 6 hours from EXST 301, MTHSC 105, 106, 108 pursuant to score on the College Board Achievement Test in Mathematics, Level II and as approved by adviser.

²Science minors should schedule CH 223, 227. Business minors should schedule BIOCH 210

³ENGL 202, 203, 204, 205, 206, 207, 208, 209

⁴Preveterinary students may substitute PHYS 207 for PHYS 200.

⁵See page 53

⁶Select 3 hours from the following: GEOG 101, 102, 301, HIST 101, 102, 172, 173, 191, POSC 101, 201, PSYCH 201, RS (SOC) 359, 401, 471, SOC 201, 202

⁷See adviser for list of minors

POULTRY BUSINESS STUDIES

FRESHMAN YEAR

First Semester		Second Semester	
AGRIC 105 Agriculture and Society	2	AGRIC 104 Intro. to Plant Sciences	3
BIOL 103 General Biology I	3	AGRIC 200 Agric. Appl. of Microcomputers	3
BIOL 105 General Biology Laboratory I	1	BIOL 104 General Biology II	3
ENGL 101 Composition I	3	BIOL 106 General Biology Laboratory II	1
Mathematics Requirement ¹	3	ECON 200 Economic Concepts	3
Social Science Elective ³	3	ENGL 102 Composition II	3
	15	PS 101 Avian Pets	1
			17

SOPHOMORE YEAR

ACCT 201 Principles of Accounting	3	ACCT 202 Principles of Accounting	3
AGEC 202 Agricultural Economics	3	FIN 210 Introduction to Investments	3
PS 201 Poultry Husbandry	3	PS 323 Poultry and Poultry Products Eval.	2
Literature Requirement ²	3	Humanities Elective ⁵	3
Approved Elective ⁴	3	Approved Elective ⁴	3
Elective	3	Elective	3
	18		17

JUNIOR YEAR

AGEC 302 Economics of Farm Management	3	ENGL 304 Business Writing	3
LAW 312 Commercial Law	3	GEN 302 Introductory Genetics	4
PS 451 Poultry Nutrition	2	or ANPH 301 Physiology and Anatomy	4
SPCH 250 Public Speaking	3	of Domestic Animals	4
Business Elective ⁶	3	or MICRO 305 General Microbiology	4
Approved Elective ⁴	3	MKT 301 Principles of Marketing	3
	17	PS 355 Poultry Prod. Grading and Tech.	3
		Elective	3
			16

SENIOR YEAR

AGEC 309 Econ. of Agric. Marketing	3	MGT 307 Personnel Management	3
EXST 301 Introductory Statistics	3	MKT 402 Consumer Behavior	3
MGT 301 Principles of Management	3	PS 400 Avian Physiology	3
PS 458 Avian Micro. and Parasitology	4	PS 402 Poultry Management	3
PS 460 Seminar	1	PS 403 Poultry Management Laboratory	1
Elective	3	PS 454 Least Cost Feed Formulation	3
	<u>17</u>	Elective	<u>3</u>
			17

134 Total Semester Hours

¹Students may schedule 3 hours from MTHSC 101, 102, 105, 106, 108 pursuant to score on the College Board Achievement Test in Mathematics, Level II and as approved by adviser

²ENGL 202, 203, 204, 205, 206, 207, 208, 209

³Select from history, political science, or psychology as shown on page 53

⁴Select from ANSC 202, 253, 255, 301, 401, DYSC 201, 402, 404, FDSC 305, 422, 424

⁵See page 53.

⁶Select from ACCT 307, AGECE 319, 409, FIN 306.

AQUACULTURE, FISHERIES, AND WILDLIFE BIOLOGY

Increased interest in and concern for conservation of natural resources and the environment and demand for seafood products and farm-raised fish has resulted in these areas becoming increasingly technical and requiring highly qualified wildlife and fisheries biologists. Greatest demands for graduates are in the following areas: management, research, survey and regulatory positions with state and federal agencies; industrial research and quality control laboratories; conservation, recreational, and other public service agencies; private enterprises and fish farms.

The undergraduate curriculum provides a solid foundation for many career opportunities in the sciences. The curriculum is strong in basic and applied sciences, communication skills and the social sciences. Twenty-seven credit hours may be selected from emphasis areas and elective course offerings. Students select an emphasis area in either aquaculture and fisheries, wildlife management, or preveterinary medicine. These allow students to expand their knowledge of aquaculture, fisheries and wildlife or to broaden their background with courses in botany, zoology, and other sciences. In addition, six semester credits are available for field training with appropriate natural resource agencies. Students can satisfy coursework requirements for professional certification by The Wildlife Society and/or the American Fisheries Society.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	3	BIOL 104 General Biology II	3
BIOL 105 Gen. Biol. Lab. I	1	BIOL 106 Gen. Biol. Lab. II	1
CH 101 General Chemistry	4	CH 102 or 112 General Chemistry ²	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 102 Intro. to Math. Analysis	3	WFB 101 Intro. to Aquaculture, Fisheries, and Wildlife	1
Social Science Requirement ¹	3	Mathematics Requirement ¹	3
	<u>17</u>	Elective	<u>3</u>
			18

SOPHOMORE YEAR

AGRON 202 Soils	4	AGEC 202 Agricultural Economics	3
BIOSC 201 Plant Diversity	4	AGRIC 200 Agric. Appl. of Microcomp or Computer Science ³	3
CH 201 Survey of Organic Chemistry or BIOCH 210 Elem. Biochem or CH 223 Organic Chemistry	4	BIOSC 202 Animal Diversity	4
and CH 227 Organic Chem. Lab	3	PHYS 200 Introductory Physics ⁴	4
WFB 350 Princ. Fish and Wildlife Biol	1	Emphasis Area ⁵	3
Elective	3		<u>17</u>
	<u>2</u>		
	17		

JUNIOR YEAR

AGM 301 Soils and Water Conservation	3	AGEC 309 Econ. of Agric. Mkt	3
ENGL 314 Technical Writing	3	or CRD 357 Nat. Res. Econ.	3
ENT 301 General Entomology	3	ANPH 301 Physiology and Anatomy	4
Humanities Requirement ¹	3	of Domestic Animals	3
Emphasis Area ⁵	4	EXST 301 Introductory Statistics	4
Elective	1	GEN 302 Introductory Genetics	3
	17	WFB 412 Wildlife Management	1
		Elective	1
			18

SENIOR YEAR

BIOSC 441 Ecology	4	WFB 450 Aquaculture	3
SPCH 250 Public Speaking	3	WFB 499 Wildlife and Fish. Seminar	1
WFB 416 Fishery Biology	3	Humanities Requirement ¹	3
WFB 462 Wetland Wildlife Biology	3	Emphasis Area ⁵	7
Emphasis Area ⁵	3	Elective	3
	16		17

137 Total Semester Hours

¹See pages 52-53 (General Education Requirements).²Students planning to take CH 223 should select CH 112.³To be selected from computer science courses and total three or more credits.⁴Preveterinary Medicine students must substitute PHYS 207.⁵Select 17 credits from one of the three Emphasis Areas:

Aquaculture and Fisheries: AGECE 425, BIOSC 280, 442, 443, 483, 484, 485, BOT 413, ENT 430, ENT (WFB) 469, MICRO 305, 403, 411, WFB 460, 490, ZOOL 403, 404, 410, 456, 463, or courses approved by the adviser.

Wildlife Biology: AGM 205, BIOSC 442, BOT 301, 431, CAPL 473, ENSC 432, FOR 205, 206, 302, 308, 310, 315, 409, 415, 416, POSC 302, WFB 490, ZOOL 415, 430, 456, 462, 464, 465, 470, 471, or courses approved by the adviser.
Preveterinary Medicine: ANSC 202, BIOCH 301, 302, CH 224, 228, MICRO 305, NUTR 401, PHYS 208, or courses approved by the adviser (See Preveterinary Medicine Requirements.)**ENTOMOLOGY**

Entomology, the study of insects, is a unique scientific discipline. Insects form the largest and most widely distributed class of animals in the world, including many of the most beneficial and harmful organisms known to man.

Exciting opportunities for professional entomologists are available in many areas, such as teaching and research, the cooperative extension service, pest control, pest management consulting, industry, the armed forces medical corps, public health agencies, and quarantine and regulatory agencies. This curriculum also provides an excellent foundation for graduate studies.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	3	BIOL 104 General Biology II	3
and BIOL 105 Gen. Biol. Lab. I	1	and BIOL 106 Gen. Biol. Lab. II	1
or BIOL 110 Prin. of Biology I	5	or BIOL 111 Prin. of Biology II	5
CH 101 General Chemistry	4	CH 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 105 Algebra and Trig. ¹	5	MTHSC 102 Intro. to Math. Analysis	3
	16-17	or MTHSC 106 Cal. of One Var. I	4
		Elective	3
			17-19

SOPHOMORE YEAR

AGRON 202 Soils	4	AGEC 202 Agriculture Economics	3
CH 223 Organic Chemistry	3	CH 224 Organic Chemistry	3
CH 227 Organic Chemistry Lab	1	GEN 302 Introductory Genetics	4
ENT 301 General Entomology	3	PHYS 200 Introductory Physics ³	4
Humanities Requirement ²	3	Humanities Requirement ²	3
Elective	3		17
	17		

JUNIOR YEAR

ENT 405 Insect Morphology	4	ACCT 201 Principles of Accounting	3
ENT 468 Research Techniques	2	or EXST 301 Intro. Statistics	3
SPCH 250 Public Speaking	3	ENT 410 Insect Taxonomy	3
Computer Science Requirement ⁴	2	MICRO 305 General Microbiology	4
Science Requirement ⁵	4	Entomology Elective ⁶	3
Elective	2	Elective	3
	<u>17</u>		<u>16</u>

SENIOR YEAR

BIOSC 441 Ecology	4	ENT 420 Toxicology of Insecticides	3
ENT 461 Directed Research in Entomology	1	ENT 462 Seminar	1
PLPA 301 Plant Pathology	3	ENT 470 Insect Physiology	3
Entomology Elective ⁶	3	Entomology Elective ⁶	3
Social Science Requirement ⁷	3	Social Science Requirement ⁷	3
Elective	3	Elective	4
	<u>17</u>		<u>17</u>

134 Total Semester Hours

¹Students who make a satisfactory score on the College Board Achievement Test in Mathematics, Level II, may schedule other mathematical sciences courses in lieu of MTHSC 105, in consultation with their advisers.

²See page 53.

³Preveterinary Medicine students must substitute PHYS 207 and take PHYS 208 as a junior-year elective.

⁴Select from computer science courses or AGRIC 200 and total two or more credits.

⁵Select from any physical or biological science.

⁶At least 6 credits must be selected from the following: ENT 401, 402, 403, 404, 455.

⁷Select from anthropology, economics, geography, history, political science, psychology, or sociology (including crosslisted rural sociology courses).

FOOD SCIENCE

The Food Science major is designed to prepare students for the many career opportunities in technical and management areas of the food industry. The food industry, being the nation's largest industry, is becoming increasingly technical and requires large numbers of professional food scientists. World food supplies, particularly those rich in protein, are becoming increasingly critical in many parts of the globe. This situation is expected to accelerate the demand for food scientists.

Opportunities for graduates in Food Science include research positions in government organizations and state experiment stations; supervisory, administrative, research and quality control positions in food processing industries; inspection and grading work with state and federal agencies; consulting, teaching and extension activities with universities and colleges. Students graduating in Food Science are well prepared to pursue postgraduate training in areas such as microbiology, biochemistry, and nutrition, as well as in food science.

The student majoring in Food Science will select a minor, which will emphasize training in an area other than food science and which is designed to supplement the major course of study.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	3	BIOL 104 General Biology II	3
and BIOL 105 Gen. Biol. Lab. I	1	and BIOL 106 General Biol. Lab. II	1
or BIOL 110 Prin. of Biol. I	5	or BIOL 111 Prin. of Biol. II	5
CH 101 General Chemistry	4	CH 102 or 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
FDSC 101 Man's Struggle for Food	1	MTHSC 106 Cal. of One Var. I	4
MTHSC 105 Algebra and Trig ¹	5	Elective	2
	<u>17-18</u>		<u>17-18</u>

SOPHOMORE YEAR

CH 223 Organic Chemistry	3	BIOCH 210 Elementary Biochemistry	4
and CH 227 Organic Chem. Lab.	1	ENGL 231 Introduction to Journalism	3
or CH 201 Survey of Org. Chem.	4	or ENGL 304 Business Writing	3
PHYS 122 Phys. with Cal. I.	3	FDSC 212 Man's Food Resources	2
or PHYS 207 Gen. Phys. I	4	PHYS 208 General Physics II	4
Literature Requirement ²	3	or PHYS 221 Phys. with Cal. II	3
Social Science Requirement ³	3	and PHYS 223 Physics Lab. II	1
Elective	3	Social Science Requirement ³	3
	<u>16-17</u>		<u>16</u>

JUNIOR YEAR

EXST 301 Introductory Statistics	3	FDSC 422 Quality Assurance and	
FDSC 305 Dairy and Food Engr.	3	Sensory Evaluation	2
MICRO 305 General Microbiology	4	FDSC 424 Quality Assurance and	
NUTR 451 Human Nutrition	3	Sensory Evaluation Lab	1
Humanities Requirement ⁴	3	MICRO 407 Food and Dairy Micro.	4
Elective	1	SPCH 250 Public Speaking	3
	<u>17</u>	Minor ⁵	3
		Elective	4-3
			<u>16-17</u>

SENIOR YEAR

FDSC 401 Food Chemistry I	4	FDSC 402 Food Chemistry II	4
FDSC 403 Food Preservation		FDSC 404 Food Preservation	
and Processing I	3	and Processing II	3
FDSC 405 Food Preservation		FDSC 406 Food Preservation	
and Processing Lab. I	1	and Processing Lab. II	1
FDSC 417 Seminar	1	FDSC 418 Seminar	1
Minor ⁵	6	Minor ⁵	6
Elective	2	Elective	2
	<u>17</u>		<u>17</u>

134 Total Semester Hours

¹Students who make a satisfactory score on the College Board Achievement Test in Mathematics, Level II must schedule other mathematics courses or electives in lieu of MTHSC 105 in consultation with adviser.

²ENGL 202, 203, 204, 205, 206, 207, 208, 209

³AGEC 202 and a selection of 3 credits from the following: GEOG 101 or 102, HIST 101, 102, 172, 173, POSC 101, PSYCH 201, RS (SOC) 401, SOC 201.

⁴At least 3 credits from art and architectural history, drama, humanities, foreign language, literature (300-level or higher), music, philosophy, religion, or visual arts courses.

⁵See adviser for available minors and course requirements.

HORTICULTURE

Horticulture is the art, science, and business that deals with fruit production, utilization, and maintenance. A strong foundation in the basic sciences and humanities is necessary in all facets of horticulture. Undergraduate majors fulfill this need by taking courses in mathematics, chemistry, botany, physics, computer science, communications, economics, and humanities. Horticulture as a science depends equally upon such applied disciplines as plant pathology, plant physiology, entomology, forestry, agronomy and soils, agricultural engineering, and agricultural economics. Business electives contribute to the well-rounded curriculum. An ever expanding segment of horticulture involves the management of enterprises, from production to distribution and marketing. Horticulture as an art involves the arrangement of plants in an aesthetically pleasing fashion, whether as a floral centerpiece or as an exterior landscape for a residence or building. All aspects of horticultural plants are the realm of the Horticulture major—growing, maintaining, selling, arranging, selecting.

The major in Horticulture broadly represents all crops and commodities. The Turfgrass option is sufficiently different so that it is listed separ-

ately. Even though broad training is required of all Horticulture majors, the opportunity exists to tailor one's courses around the traditional commodities (fruits, vegetables, nursery crops, landscape design, and floriculture) by the appropriate selection of electives within the major.

Enhancements allow the student to begin professional development while still enrolled as an undergraduate major. The opportunity to complete an internship in a horticultural enterprise is one enhancement that is strongly recommended. Students considering graduate school are advised to enhance their programs by taking optional courses in the basic sciences as well as by conducting an undergraduate research project. Persons with strong interests in a specific discipline may complete special problems under the direct supervision of an appropriate faculty member. The state-of-the-art computer laboratory in the Department of Horticulture and the integration of computer applications into most horticulture courses ensure that all students develop computer skills.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	3	BOT 205 Plant Form and Function	4
BIOL 105 General Biology Lab I	1	CH 102 General Chemistry	4
CH 101 General Chemistry	4	ENGL 102 Composition II	3
ENGL 101 Composition I	3	EXST 301 Introductory Statistics	3
HORT 101 Horticulture	3	or MTHSC 101 Finite Probability	3
MTHSC 102 Intro. to Math. Analysis	3	Social Science Requirement ¹	3
	<u>17</u>		<u>17</u>

SOPHOMORE YEAR

BOT 431 Plant Taxonomy	4	AGRON 202 Soils	4
CH 223 Organic Chemistry	3	AGRIC 200 Ag. Appl. of Microcomp.	3
and CH 227 Organic Chemistry Lab.	1	or CPSC 120 Intro. to Inform. Proc. Sys.	3
or BIOCH 210 Elem. Biochemistry	4	HORT 208 Landscape Appreciation	3
or CH 201 Survey of Org. Chem.	4	PHYS 200 Introductory Physics	4
ENT 301 General Entomology	3	SPCH 250 Public Speaking	3
HORT 303 Plant Materials	3		<u>17</u>
Literature Requirement ¹	3		
	<u>17</u>		

JUNIOR YEAR

HORT 305 Plant Propagation	3	AGM 301 Soil and Water Conservation	3
HORT 456 Vegetable Crops	4	BOT 421 Plant Physiology	4
Horticulture Requirement ²	3	ENGL 304 Business Writing	3
Humanities Requirement ¹	3	or ENGL 314 Technical Writing	3
Science Requirement ³	4	HORT 310 Floriculture	3
	<u>17</u>	Business Requirement ⁴	3
		Elective	1
			<u>17</u>

SENIOR YEAR

HORT 352 Commercial Pomology	3	HORT 409 Seminar	1
or HORT 455 Small Fruit Crops	3	PLPA 301 Plant Pathology	3
HORT 412 Turf Management	3	Horticulture Requirement ²	3
Horticulture Requirement ²	3	Science Requirement ³	3
Business Requirement ⁴	3	Social Science Requirement ⁵	3
Elective	6	Elective	3
	<u>18</u>		<u>16</u>

136 Total Semester Hours

¹See General Education requirement

²FOR 309, HORT 304, 308, 352 or 455, 400, 406, 415, 416, 433, 461, 462, 464, 470

³AGRON 407, 452, 490, BIOSC 441, 452, GEN 302, MICRO 305

⁴ACCT 200, 201, LAW 312, MGT 301, 307, MKT 301

⁵AGTC 202 or ECON 211

HORTICULTURE—TURFGRASS

The Turfgrass option differs from the Horticulture major in that courses in park and recreation management, agricultural mechanization, personnel management, and certain specified science courses are required. The required horticulture courses are also different. This option has been carefully tailored for individuals who seek careers in turfgrass production, golf course and park management, and other turfgrass related industries.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	3	BOT 205 Plant Form and Function	4
BIOL 105 General Biology Lab. I	1	CH 102 General Chemistry	4
CH 101 General Chemistry	4	ENGL 102 Composition II	3
ENGL 101 Composition I	3	EXST 301 Introductory Statistics	3
HORT 101 Horticulture	3	or MTHSC 101 Finite Probability	3
MTHSC 102 Intro. to Math. Analysis	3	Social Science Requirement ¹	3
	<u>17</u>		<u>17</u>

SOPHOMORE YEAR

CH 223 Organic Chemistry	3	AGRON 202 Soils	4
and CH 227 Org. Chem. Lab.	1	ENGL 304 Business Writing	3
or BIOCH 210 Elem. Biochemistry	4	or ENGL 314 Technical Writing	3
or CH 201 Survey of Org. Chemistry	4	ENT 301 General Entomology	3
HORT 303 Plant Materials	3	HORT 208 Landscape Appreciation	3
HORT 305 Plant Propagation	3	PHYS 200 Introductory Physics	4
PRTM 307 Park Maintenance and Oper.	3		<u>17</u>
Social Science Requirement ²	3		
Elective	1		
	<u>17</u>		

JUNIOR YEAR

HORT 412 Turfgrass Management	3	AGM 205 Principles of Farm Shop	3
MGT 307 Personnel Management	3	AGM 301 Soil and Water Conservation	3
SPCH 250 Public Speaking	3	AGRIC 200 Agric. Appl. of Microcomp.	3
Literature Requirement ¹	3	or CPSC 120 Intro. to Inform. Proc. Sys.	3
Elective	3	BOT 421 Plant Physiology	4
	<u>15</u>	Horticulture Requirement ³	3
		Elective	1
			<u>17</u>

SENIOR YEAR

Horticulture Requirement ³	3	HORT 406 Nursery Technology	3
Humanities Requirement ¹	3	HORT 409 Seminar	1
Science Requirement ⁴	7	PLPA 301 Plant Pathology	3
Elective	4	Horticulture Requirement ³	3
	<u>17</u>	Science Requirement ⁴	3
		Elective	4
			<u>17</u>

134 Total Semester Hours

¹See General Education Requirements

²AGEC 202 or ECON 211

³FOR 309, HORT 304, 308, 310, 352, 400, 415, 416, 433, 455, 456, 461, 462, 470

⁴AGRON 407, 452, 490, BIOSC 441, 452, GEN 302, MICRO 305

PACKAGING SCIENCE

Packaging Science is a discipline that involves the use of materials, methods, and machinery to develop and produce packages that protect and preserve products, instructs the consumer in the product's proper use and helps market the product. On the basis of Gross National Product, it is the third largest industry in the United States and is truly inter-

national in character. It is an extremely dynamic field and is growing rapidly. Virtually everything grown or manufactured is packaged in some fashion. The food industry is the largest user of packages, but non-food packaging is essential also. Tamper-evident packaging is an integral part of the pharmaceutical industry, and packaging to prevent abuse of sensitive electronic equipment is assuming greater importance as more consumers purchase computers, television sets, and microwave ovens for example.

Opportunities for employment include a wide variety of career paths; i.e., marketing, manufacturing, research and development, design, transportation and distribution. Corporations which manufacture and sell packages as well as companies that purchase and use packages need well-educated and well-trained packaging personnel. If career interests lie in the regulatory field, interesting positions exist in state and federal governments; i.e., the Department of Agriculture and the Food and Drug Administration.

The student majoring in Packaging Science will select from two options—Food Packaging and General Packaging. The basic curricula are the same, but students selecting the Food Packaging option are required to have more food-related courses than those with the General Packaging option.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	3	BIOL 104 General Biology II	3
BIOL 105 General Biology Lab I	1	BIOL 106 General Biology Lab II	1
CH 101 General Chemistry	4	CH 102 or 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 105 Algebra and Trig. ¹	5	MTHSC 106 Calculus of One Var. I	4
PKGSC 101 Packaging Orientation	1	PKGSC 102 Intro. to Pkg. Science	2
	17	Elective	1
			18

SOPHOMORE YEAR

CH 201 Survey of Organic Chemistry	4	GC 104 Graphic Arts I	3
or CH 223 Organic Chemistry Lab	3	PHYS 208 General Physics II ³	4
and CH 227 Organic Chemistry Lab	1	PKGSC 204 Container Systems	2
CPSC 110 Elem. Computer Program ⁴	3	PKGSC 206 Container Systems Lab	1
PHYS 207 General Physics I ³	4	Emphasis Area ²	3
PKGSC 200 Pkg. Materials in Mfg	2	Literature Requirement ⁵	3
Emphasis Area ²	5		16
	18		

JUNIOR YEAR

EXST 301 Introductory Statistics	3	ENGL 304 Business Writing	3
MICRO 305 General Microbiology	4	INED 316 Plastics and Plastic Processes	3
PKGSC 368 Packaging and Society	3	SPCH 250 Public Speaking	3
Emphasis Area ²	3	Emphasis Area ²	3
Social Science Requirement ⁶	3	Humanities Requirement ⁷	3
Elective	2	Social Science Requirement ⁶	3
	18		18

SENIOR YEAR

FDSC 401 Food Chemistry I	4	FDSC 464 Food Packaging Systems	3
FDSC 403 Food Pres. and Proc. I	3	FDSC 466 Food Packaging Sys. Lab	1
FDSC 405 Food Pres. and Proc. Lab. I	1	PKGSC 404 Mechanical Properties	
FDSC 417 Seminar	1	of Materials and Prin. of Eval	3
Emphasis Area ²	3	PKGSC 454 Packaging Eval. Lab.	2
Elective	4	Emphasis Area ²	4
	16	Elective	3
			16

137 Total Semester Hours

¹Students who make a satisfactory score on the Mathematics Test, Level II (Standard) may schedule other mathematics courses or electives in lieu of MTHSC 105, in consultation with adviser.

²See adviser.³PHYS 122, 124, 221, and 223 may be substituted.⁴CPSC 120 may be substituted.⁵ENGL 202, 203, 204, 205, 206, 207, 208, 209.⁶AGEC 202 and a selection of three credits from the following: GEOG 101 or 102; HIST 101, 102, 172, 173; POSC 101; PSYCH 201; RS (SOC) 401; SOC 201.⁷At least 3 credits from art and architectural history, drama, humanities, foreign language literature (300-level or higher), music, philosophy, religion, or visual arts courses.

PLANT PATHOLOGY

Plant pathology, the study of plant diseases, is a challenging biological and agricultural science. As a career, it is exciting, essential, and rewarding. As a profession, it requires ambition, skill, and dedication, while offering the opportunity for intellectual and personal fulfillment. Plant pathologists continually pit their abilities and energies against more than 50,000 destructive plant diseases.

Job opportunities include private consulting, cooperative extension services, agricultural sales, federal and state government and foreign service, technical work, biotechnology, various integrated pest-management programs, farming, and graduate programs. Salaries are competitive with other biological and agricultural professions.

Advisers for plant pathology undergraduates attempt to tailor the program of study to fit the student's long-term goals.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	3	BIOL 104 General Biology II	3
and BIOL 105 Gen. Biol. Lab. I	1	and BIOL 106 Gen. Biol. Lab. II	1
or BIOL 110 Prin. of Biology I	5	or BIOL 111 Prin. of Biology II	5
CH 101 General Chemistry	4	CH 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 102 Intro. to Math. Analysis	3	Elective	7
	14-15		18-19

SOPHOMORE YEAR

AGRIC 200 Agric. Appl. of Microcomp.	3	AGEC 202 Agricultural Economics	3
AGRON 202 Soils	4	CH 224 Organic Chemistry	3
CH 223 Organic Chemistry	3	GEN 302 Introductory Genetics	4
CH 227 Organic Chemistry Lab	1	PHYS 200 Introductory Physics	4
ENT 301 General Entomology	3	Humanities Requirement ¹	3
Humanities Requirement ¹	3		17
	17		

JUNIOR YEAR

BIOCH 301 General Biochemistry	3	BOT 421 Plant Physiology	4
MICRO 305 General Microbiology	4	BOT 431 Introductory Plant Taxonomy	4
PLPA 301 Plant Pathology	3	PLPA 456 Plant Virology	3
Departmental Requirement ²	3	SPCH 250 Public Speaking	3
Social Science Requirement ¹	3	Elective	3
	16		17

SENIOR YEAR

BOT 411 Introductory Mycology	4	PLPA 451 Bacterial Plant Pathogens	3
EXST 301 Introductory Statistics	3	Departmental Requirement ²	3
PLPA 458 Plant Parasitic Nematodes	3	Elective	12
Departmental Requirement ²	3		18
Social Science Requirement ¹	3		
Elective	2		
	18		

135-137 Total Semester Hours

¹See page 53.²At least 9 credits must be selected from the following: AGRON 405, 407, 421, 422, 423, 425, 490, BIOCH 301, 423, 424, 425, 426, CH 313, 317, ENT 401, 402, HORT 305, 352, 455, MICRO 416, PLPA 411, 412.

PREVETERINARY MEDICINE

Under a regional plan, the South Carolina Preveterinary Advisory Committee coordinates a program for all South Carolina residents who are interested in pursuing a career in veterinary medicine. South Carolina residents attending any college or university may apply through the South Carolina Advisory Committee to the University of Georgia College of Veterinary Medicine. Currently, the University of Georgia admits up to seventeen students each year through arrangements with the Southern Regional Education Board.

Tuskegee Institute in Alabama and North Carolina State University have excellent programs in veterinary medicine. Application must be made directly to the respective schools. Currently, Tuskegee admits four South Carolina residents and North Carolina State admits two.

Minimum requirements for admission to a college of veterinary medicine generally include the satisfactory completion of a minimum of two years of college in a well-rounded undergraduate degree program. Specific requirements for admission to the University of Georgia College of Veterinary Medicine include the following undergraduate courses: eight semester credits each of English and physics, twelve semester credits of biology and sixteen semester credits of organic and inorganic chemistry. (Chemistry and physics courses must be at the premedical level. They may not be survey courses.) In addition, four semester credits each of microbiology and biochemistry, including laboratories, and three semester credits of animal nutrition are required. (In addition, North Carolina State requires courses in mathematics and statistics.)

Further, the South Carolina Preveterinary Committee recommends that in order to be in the best possible competitive position, the applicant should complete courses in animal agriculture, genetics, nutrition, biochemistry, and advanced biology subjects. Considerations for selection are character, scholastic achievements, personality, health, experience with animals, general knowledge, and motivation. In the past, competition has been very keen and only those applicants who have shown exceptional ability have been admitted. Specific considerations may include a minimal grade-point average and completion of standardized tests such as the Graduate Record Examination and the Veterinary Aptitude Test.

Since out-of-state students attending Clemson University are ineligible to apply to the University of Georgia or Tuskegee Institute under the South Carolina quota, they should contact and subsequently satisfy the entrance requirements of the specific college(s) of veterinary medicine to which they plan to apply.

Veterinary schools accept students with a broad range of academic backgrounds; therefore, it is recommended that the beginning university student select any undergraduate major and simultaneously complete the courses required for veterinary school entrance and those required for completion of a BS or BA degree. For students selecting Animal Science, Dairy Science, or Poultry Science in the College of Agricultural Sciences and Zoology in the College of Sciences at Clemson University, the basic curricula have been designed to accommodate Georgia's entrance requirements. For further information, contact the chairperson of the Preveterinary Medicine Curriculum Committee.

COLLEGE OF ARCHITECTURE

The Clemson University College of Architecture provides coordinated preprofessional and professional degree programs at undergraduate and graduate levels in preparation for careers in architecture, building science and management, city and regional planning, and visual arts. The preprofessional offerings of the College also provide an excellent basis for graduate studies in art and architectural history and landscape architecture. It is a member of the Association of Collegiate Schools of Architecture, the Associated Schools of Construction, and the American Planning Association and is accredited by the National Architectural Accrediting Board, Association of Collegiate Schools of Planning, and the American Council for Construction Education.

The Clemson Architectural Foundation provides the Charles E. Daniel Center for Building Research and Urban Studies in Genoa, Italy. Graduate students in the College of Architecture may spend one semester at the Center in an intensive program of study and travel, while receiving full credit toward their degree.

ENTRANCE REQUIREMENTS

In the interest of both students and the conservation of University resources and to maintain a program of the highest level, admission to the College of Architecture must necessarily be on a selective basis. Annual enrollment quotas are established consistent with space available.

Students wishing admission are advised to make application to the University early in the fall of their senior year in high school and to make arrangements for a personal interview with the Dean of the College or department head as early as possible in the year before admission.

PROGRAMS OF STUDY

The programs of study in the College of Architecture all begin with a common freshman year. Upon conclusion of the freshman year, students may choose one of four undergraduate programs: Bachelor of Arts or Bachelor of Science in Design with studies in Architecture or Planning; Bachelor of Science in Building Science and Management with emphasis on construction management; Bachelor of Fine Arts; and the Bachelor of Landscape Architecture which is a five-year program.

Two-year graduate programs are offered in the College that lead to professional degrees of Master of Architecture, Master of City and Regional Planning, Master of Fine Arts, and Master of Building Science and Management.

DESIGN

The College of Architecture offers either the Bachelor of Arts or Bachelor of Science degree in Design with studies in Architecture or City and Regional Planning.

Students enrolled in second-, third-, or fourth-year Design studies and theory courses must attain at least a 2.0 grade-point ratio in each year level (by repeating one or both semesters, if necessary) to qualify for advancement to the next year level or in the case of fourth year Design studies, to qualify for the Design degree.

ARCHITECTURE

As a practicing professional, the creative responsibility of designing the buildings which shape our physical environment. To understand the humanistic, economic and technological nature of environmental problems the student must have a sound general education. Subsequent professional education must be preparation for a life of continuing change in which the problems to be solved will be large and small, for every sort of function, in every type of climate and for every condition of budget.

The curricula leading to the BA and BS in Design degree with studies in Architecture are conceived as fundamental parts of the prescribed sequence preparing students for the professional graduate degree, Master of Architecture. An effort is made to offer balanced general education offerings coordinate with an effective core of basic professional studies.

Students who have earned baccalaureate degrees in disciplines other than architecture, who wish to pursue a professional degree in Architecture, may be admitted through the graduate school as post-baccalaureate students. Students will remain in this category for such period of time as required to attain proficiency in the core courses required in the undergraduate Design program. Upon achieving this proficiency, the student may be admitted to the graduate program.

ARCHITECTURE STUDIES

Degree: BA in Design

FRESHMAN YEAR

First Semester		Second Semester	
CAAH 101 Survey of Art and Arch. Hist. I	3	CAAH 102 Survey of Art and Arch. Hist. II	3
CADS 151 Design Studies I	2	CADS 152 Design Studies II	2
CADS 153 Design Theory I	2	CADS 154 Design Theory II	2
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I ¹	4	MTHSC 301 Stat. Theory and Methods I ¹	3
PHYS 207 General Physics I ^{2,3}	4	PHYS 208 General Physics ^{2,3}	4
	18	Elective	1
			18

SOPHOMORE YEAR

CAAH 203 Hist. and Theory of Arch. I	3	CAAH 204 Hist and Theory of Arch. II	3
CABS 201 Structures I	3	CABS 202 Structures II	3
CADS 251 Design Studies III	3	CADS 252 Design Studies IV	3
CADS 253 Design Theory III	3	CADS 254 Design Theory IV	3
Social Science Requirement ⁷	3	Social Science Requirement ⁷	3
Visual Arts ⁴	3	Visual Arts ⁴	3
	18		18

JUNIOR YEAR

CAAR 351 Design Studies V	6	CAAR 352 Design Studies VI	6
CABS 301 Structures III	3	CABS 302 Structures IV	3
Literature Requirement ⁵	3	English Requirement ⁶	3
Modern Language ³	4	Modern Language ³	4
Elective	3	Elective	3
	19		19

SENIOR YEAR

CAAR 451 Design Studies VII	6	CAAR 452 Design Studies VIII	6
CABS 304 Environmental Systems I	3	CABS 403 Environmental Systems II	3
Major Studies Elective	3	Major Studies Elective	6
Modern Language ³	3	Modern Language ³	3
Elective	3		18
	18		

¹A sequence of MTHSC 101, 102 and 203 will be accepted in lieu of MTHSC 106 and 301

²With consent of adviser, BIOL 103, 104, 105, 106; CH 101, 102, GEOL 101, 102 may be substituted for PHYS 207 and 208.

³With consent of adviser, modern language may be taken in the freshman and sophomore years.

⁴CAVA 205, 207, 209, 211, 213, 215, 217

⁵ENGL 202, 203, 204, 205, 206, 207, 208, 209.

⁶ENGL 231, 304, 312, 314, SPCH 250.

⁷See page 53.

Note: MTHSC 105 will not count toward elective credit for a degree in Design.

ARCHITECTURE STUDIES

Degree: BS in Design

FRESHMAN YEAR

First Semester		Second Semester	
CAAH 101 Survey of Art and Arch. Hist. I	3	CAAH 102 Survey of Art and Arch. Hist. II	3
CADS 151 Design Studies I	2	CADS 152 Design Studies II	2
CADS 153 Design Theory I	2	CADS 154 Design Theory II	2
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I ¹	4	MTHSC 301 Stat. Theory and Methods I ¹	3
PHYS 207 General Physics I	4	PHYS 208 General Physics II	4
	18	Elective	1
			18

SOPHOMORE YEAR

CAAH 203 Hist. and Theory of Arch. I	3	CAAH 204 Hist. and Theory of Arch. II	3
CABS 201 Structures I	3	CABS 202 Structures II	3
CADS 251 Design Studies III	3	CADS 252 Design Studies IV	3
CADS 253 Design Theory III	3	CADS 254 Design Theory IV	3
Social Science Requirement ⁵	3	Social Science Requirement ⁵	3
Visual Arts ²	3	Visual Arts ²	3
	18		18

JUNIOR YEAR

CAAR 351 Design Studies V	6	CAAR 352 Design Studies VI	6
CABS 301 Structures III	3	CABS 302 Structures IV	3
Major Studies Elective	3	Major Studies Elective	3
Literature Requirement ³	3	English Requirement ⁴	3
Elective	3	Elective	3
	18		18

SENIOR YEAR

CAAR 451 Design Studies VII	6	CAAR 452 Design Studies VIII	6
CABS 304 Environmental Systems I	3	CABS 403 Environmental Systems II	3
Major Studies Elective	6	Major Studies Elective	9
Elective	3		18
	18		

144 Total Semester Hours

¹A sequence of MTHSC 101, 102 and 203 will be accepted in lieu of MTHSC 106 and 301

²CAVA 205, 207, 209, 211, 213, 215, 217

³ENGL 202, 203, 204, 205, 206, 207, 208, 209

⁴ENGL 231, 304, 312, 314, SPCH 250.

⁵See page 53.

Note: MTHSC 105 will not count toward elective credit for a degree in Design

CITY AND REGIONAL PLANNING STUDIES

Degree: BA¹ or BS in Design

The city planner is concerned with the programming and guiding of urban and regional development. Our expanding society presents many unusual opportunities for planning graduates in private firms and on public agency staffs. The City and Regional Planning Studies is for students who are motivated toward work on a large scale. After completion of this study,

the student is in a position to undertake work leading to the Master of City and Regional Planning or the Master of Architecture in Urban Design.

FRESHMAN YEAR

First Semester		Second Semester	
CAAH 101 Survey of Art and Arch. Hist. I	3	CAAH 102 Survey of Art and Arch. Hist. II	3
CADS 151 Design Studies I	2	CADS 152 Design Studies II	2
CADS 153 Design Theory I	2	CADS 154 Design Theory II	2
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I ²	4	MTHSC 301 Stat. Theory and Methods. I ²	3
PHYS 207 General Physics I	4	PHYS 208 General Physics II	4
	18	Elective	1
			18

SOPHOMORE YEAR

CAAH 203 Hist. and Theory of Arch. I	3	CAAH 204 Hist. and Theory of Arch. II	3
CABS 201 Structures I	3	CABS 202 Structures II	3
CADS 251 Design Studies III	3	CADS 252 Design Studies IV	3
CADS 253 Design Theory III	3	CADS 254 Design Theory IV	3
ECON 211 Principles of Economics	3	ECON 212 Principles of Economics	3
Visual Arts ³	3	Visual Arts ³	3
	18		18

JUNIOR YEAR

CAAR 351 Design Studies V ⁴	6	CAAR 352 Design Studies VI ⁴	6
or CALA 351 Design Studies V ⁴	6	or CALA 352 Design Studies VI ⁴	6
CABS 301 Structures III	3	CABS 304 Environmental Systems I	3
or AGM 301 Soil and Water Conserv.	3	or CABS 403 Environmental Systems II	3
or AGM 302 Rainfall, Runoff, and Erosion Cont.	3	CPSC 110 Elem. Comp. Programming	3
CAPL 411 Introduction to Planning	3	English Requirement ⁶	3
Literature Requirement ⁵	3	Planning Elective	3
Elective	3		18
	18		

SENIOR YEAR

CAAR 451 Design Studies VII ⁴	6	CAAR 452 Design Studies VIII ⁴	6
or CALA 451 Design Studies VII ⁴	6	or CALA 452 Design Studies VIII ⁴	6
Major Studies Elective ⁷	6	Major Studies Elective ⁷	6
Planning Elective	3	Planning Elective	3
Elective	3	Elective	3
	18		18

144 Total Semester Hours

¹Students earning credit for four semesters of the same modern language may be awarded the BA degree in Design. Note that only one degree in Design will be awarded.
²A sequence of MTHSC 101, 102 and 203 will be accepted in lieu of MTHSC 106 and 301
³CAVA 205, 207, 209, 211, 213, 215, 217.
⁴The selection of CAAR or CALA Design Studies and electives is to be made based upon the students interest in architecture or landscape architecture.
⁵ENGL 202, 203, 204, 205, 206, 207, 208, 209
⁶ENGL 231, 304, 312, 314, SPCH 250.
⁷Major Studies electives include (but are not limited to) CAAH 405, CPSC 210, CRD (AGEC) 411, POSC 302

BACHELOR OF FINE ARTS

The Bachelor of Fine Arts degree is the recognized professional undergraduate degree in Visual Arts. There are seven studio areas available in the program: drawing, painting, sculpture, printmaking, photography, graphic design, and ceramics. In the junior and senior years, each student directs his/her creative efforts toward a concentration in one or two of these areas. Students are also encouraged to elect related career-oriented coursework in other colleges.

FRESHMAN YEAR

First Semester		Second Semester	
CAAH 101 Survey of Art and Arch. Hist. I	3	CAAH 102 Survey of Art and Arch. Hist. II	3
CADS 151 Design Studies I	2	CADS 152 Design Studies II	2
CADS 153 Design Theory I	2	CADS 154 Design Theory II	2
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable ¹	4	MTHSC 301 Statistical Theory and Meth. ¹	4
Science and Laboratory	4	Science and Laboratory	4
	18		17

SOPHOMORE YEAR

CAAH 205 Hist. and Theory of Art I	3	CAAH 206 Hist. and Theory of Art II	3
CAAR 201 Art of Architecture	3	CAAR 202 Art with Architecture	3
CAVA 205 Beginning Drawing	3	CAVA 211 Beginning Printmaking	3
CAVA 207 Beginning Painting	3	CAVA 213 Beginning Photography	3
CAVA 209 Beginning Sculpture	3	CAVA 305 Drawing	3
CPSC 120 Intro. to Infor. Proc. Sys	3	MUS 210 Music Appreciation	3
	18		18

JUNIOR YEAR

CAAH 305 Contemporary Art History	3	CAVA 217 Beginning Ceramics	3
CAVA 215 Beginning Graphic Design	3	Art and Arch. History Elective	3
Literature Requirement ²	3	Communications Requirement ³	3
Major Studies Elective	3	Major Studies Elective	3
Visual Arts Requirement ⁴	3	Visual Arts Requirement ⁴	3
Elective	3	Elective	3
	18		18

SENIOR YEAR

CAVA 471 BFA Senior Project I	5	CAVA 472 BFA Senior Project II	5
Major Studies Elective	3	Major Studies Elective	3
Social Science Requirement ⁵	3	Social Science Requirement ⁵	3
Visual Arts Requirement ⁴	3	Visual Arts Requirement ⁴	3
Elective	3	Elective	3
	17		17

141 Total Semester Hours

¹A sequence of MTHSC 101, 102 and 203 will be accepted in lieu of MTHSC 106 and 301
²ENGL 202, 203, 204, 205, 206, 207, 208, 209
³ENGL 231, 304, 312, 314, SPCH 250
⁴Visual Arts Requirement (300-400 level visual arts courses).
⁵See General Education Requirements

BACHELOR OF SCIENCE IN BUILDING SCIENCE AND MANAGEMENT

As the largest single industry in the United States and one of the most important, construction offers unlimited opportunities to highly motivated and professionally educated young men and women. Future professionals must be skilled in managing people, equipment, and capital, coupled with a grasp of construction materials and methods and the complex technologies of modern construction. The Building Science and Management curriculum is the basis for either a career in construction or as a developer or building management specialist.

FRESHMAN YEAR

First Semester		Second Semester	
CAAH 101 Survey of Art and Arch. Hist. I	3	CAAH 102 Survey of Art and Arch. Hist. II	3
CADS 151 Design Studies I	2	CADS 152 Design Studies II	2
CADS 153 Design Theory I	2	CADS 154 Design Theory II	2
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable ¹	4	MTHSC 301 Stat. Theory and Methods ¹	3
PHYS 207 General Physics I	4	PHYS 208 General Physics II	4
	18	Elective	1
			18

SOPHOMORE YEAR

CABS 201 Structures I	3	ACCT 203 Financial Accounting	3
CABS 203 Mats. and Methods of Const.	3	CABS 202 Structures II	3
CPSC 120 Intro. to Info. Processing Sys.	3	CABS 204 Contract Documents	3
ECON 211 Principles of Economics	3	CE 201 Surveying	3
Literature Requirement ³	3	ECON 212 Principles of Economics	3
Elective	3	Elective	3
	18		18

JUNIOR YEAR

CABS 301 Structures III	3	CABS 302 Structures IV	3
CABS 351 Const. Management I	3	CABS 303 Soils and Foundations	3
English Requirement ⁴	3	CABS 304 Environmental Systems I	3
Visual Arts ²	3	CABS 352 Const. Management II	3
Major Elective ⁵	3	CABS 353 Const. Management III	3
Elective	3	Law 322 Legal Environ. of Business	3
	18		18

SENIOR YEAR

CABS 401 Formwork and Placing Const.	3	CABS 402 Heavy Const. Equipment	3
CABS 453 Const. Management IV	3	or CE 439 Const. Equip. Sel. and Maint.	3
CABS 461 Const. Economic Seminar	3	CABS 454 Const. Management V	6
Major Elective ⁵	6	Major Elective ⁵	6
	15		15

138 Total Semester Hours

¹A sequence of MTHSC 101, 102 and 203 will be accepted in lieu of MTHSC 106 and 301

²CAVA 205, 207, 209, 211, 213, 215, 217.

³ENGL 202, 203, 204, 205, 206, 207, 208, 209

⁴ENGL 231, 304, 312, 314, SPCH 250

⁵Select from approved departmental list or as approved in writing by adviser and department head.
Note:

1. A minimum grade of C is required in each of the following courses: CABS 203, 204, 303, 304, 351, 352, 401, 402, 453, 454, 461.
2. A minimum of 800 hours of construction experience will be required prior to graduation

BACHELOR OF LANDSCAPE ARCHITECTURE

Landscape architecture derives from the application of cultural, aesthetic, and scientific knowledge to the solution of problems of functional and aesthetic use of the land. Studio offerings at Clemson will stimulate broad problem precepts and help develop methodologies to be exercised in their solution. Landscape architecture embraces aspects of allied professions, including architecture, civil engineering, and horticulture and draws on the areas of ecology, geology, sociology, hydrology, forestry, and other social, natural, and applied sciences. This five-year program leads to the professional degree, Bachelor of Landscape Architecture.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I ¹	3	BIOL 104 General Biology II ¹	3
BIOL 105 General Biology Lab. I ¹	1	BIOL 106 General Biology Lab. II ¹	1
CAAH 101 Survey of Art and Arch. Hist. I	3	CAAH 102 Survey of Art and Arch. Hist. II	3
CADS 151 Design Studies I	2	CADS 152 Design Studies II	2
CADS 153 Design Theory I	2	CADS 154 Design Theory II	2
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I ²	4	MTHSC 301 Statistical Theory and Meth. ³	3
	18	Elective	1
			18

SOPHOMORE YEAR

CAAH 203 Hist. and Theory of Arch. I	3	CAAH 204 Hist. and Theory of Arch. II	3
CABS 201 Structures I	3	CADS 252 Design Studies IV	3
CADS 251 Design Studies III	3	CADS 254 Design Theory IV	3
CADS 253 Design Theory III	3	CALA 262 Landscape Arch. Tech. I	3
HORT 303 Plant Materials	3	HORT 304 Annuals and Perennials	3
Social Science Requirement ⁴	3	Social Science Requirement ⁴	3
	18		18

JUNIOR YEAR

CALA 351 Design Studies in Landscape Architecture V	6	CALA 352 Design Studies in Landscape Architecture VI	6
HORT 308 Landscape Design	4	CALA 362 Landscape Arch. Tech. II	3
Language or Computers ⁵	3-4	English Requirement ⁸	3
Literature Requirement ⁶	3	Language or Computers ⁵	4-3
Visual Arts Elective ⁷	3	Visual Arts Elective ⁷	3
	19-20		19-18

SENIOR YEAR⁹

CALA 451 Design Studies in Landscape Architecture VII	6	CAAH 416 History of Landscape Arch.	3
HORT 461 Problems in Landscape Design	4	CALA 452 Design Studies in Landscape Architecture VIII	6
Language or Prof. Support Elective ⁵	3	CALA 462 Landscape Arch. Tech. III	3
Elective	6	Language or Prof. Support Elective ⁵	3
	19	Elective	3
			18

PROFESSIONAL YEAR¹⁰

Professional Support Elective ⁵	17	CALA 552 Professional Landscape Architectural Design	6
	17	CALA 562 Landscape Arch. Tech. IV	2
		CALA 581 Professional Practice	3
		Professional Support Elective ⁵	3
		Elective	3
			17

180 Total Semester Hours

¹PHYS 207, 208 may be substituted for BIOL 103/105 and BIOL 104/106 (transfer student or change of major only).

²A sequence of MTHSC 101, 102 and 203 will be accepted in lieu of MTHSC 106 and 301.

³MTHSC 308, EXST 301 may be taken in lieu of MTHSC 301.

⁴See page 53.

⁵See adviser.

⁶ENGL 202, 203, 204, 205, 206, 207, 208, 209.

⁷CAVA 205, 207, 209, 211, 213, 215, 217.

⁸ENGL 231, 304, 312, 314, SPCH 250.

⁹Students accepted into graduate studies elsewhere may petition to graduate at the end of their senior year with a subprofessional BA or BS in Design degree. Students earning credit for four semesters of the same modern language may elect to receive the BA in Design. Note that only one degree in Design will be awarded.

¹⁰Exceptional students may be permitted to spend this semester at the Daniel Center in Genoa, Italy.

Note: Students enrolled in second-, third-, or fourth-year Design Studies must attain at least a 2.0 grade-point ratio in each year level (by repeating one or both semesters, if necessary) to qualify for advancement to the next year level or in the case of fifth year design studies, to qualify for the Bachelor of Landscape Architecture degree.

COLLEGE OF COMMERCE AND INDUSTRY

The programs of the College of Commerce and Industry embrace three major areas: teaching, research, and public service. The College is responsible for eight graduate programs (two in cooperation with other administrative units), ten undergraduate programs, and a series of professional development courses for business and industry. The undergraduate curricula are in the areas of Accounting, Economics, Financial Management, Industrial Management, Management, Marketing, Textile Chemistry, Textile Science, and Textile Management. These curricula are designed to prepare the student for a variety of careers, as well as to furnish an education on which to build for a lifetime. The curricula recognize the need for an understanding of the basic principles of science and appreciation for the nature of human interaction, and the comprehension of the economic, political, and social environment. Flexibility in course selection and choice of areas for emphasis is made possible by secondary concentrations and minors as indicated.

ACCOUNTING

This curriculum leads to the Bachelor of Science degree in Accounting. The degree program is accredited by the American Assembly of Collegiate Schools of Business and is designed to prepare students for professional careers in accounting and management. The major study of accounting is well supported by sequential courses in English, mathematics, management, economics, and computer science.

The graduate in Accounting is well prepared for entrance into law school, graduate school, or the practice of accountancy, either public, private, or governmental. The study of accounting in preparation for a career in other areas of management will provide mastery over an essential tool which reinforces experience and judgement in the decision-making process.

FRESHMAN YEAR

First Semester		Second Semester	
ACCT 201 Principles of Accounting	3	ACCT 202 Principles of Accounting	3
ENGL 101 Composition I	3	CPSC 120 Intro. to Infor. Proc. Sys.	3
MTHSC 102 Intro. to Math. Analysis ¹	3	ENGL 102 Composition II	3
Laboratory Science Sequence	4	MTHSC 207 Multivariable Calculus ¹	3
Social Science Requirement ²	3	Laboratory Science Sequence	4
Elective	1		16
	17		

SOPHOMORE YEAR

CPSC 130 Data Processing with Cobol	3	ECON 212 Principles of Economics	3
ECON 211 Principles of Economics	3	MASC 312 Decision Models for Mgt.	3
MTHSC 301 Stat. Theory and Meth. I	3	PHIL 344 Business Ethics	3
PHIL 102 Introduction to Logic	3	SPCH 250 Public Speaking	3
Literature Requirement ⁴	3	English/History Requirement ⁶	3
	15	Social Science Requirement ²	3
			18

JUNIOR YEAR

ACCT 301 Intermediate Accounting	3	ACCT 302 Intermediate Accounting	3
ACCT 303 Cost Accounting	3	ACCT 422 Accounting Infor. Systems	3
FIN 311 Financial Management I	3	ENGL 304 Business Writing	3
MGT 301 Principles of Management	3	FIN 312 Financial Management II	3
MKT 301 Principles of Marketing	3	LAW 312 Commercial Law	3
	15		15

SENIOR YEAR

ACCT 401 Financial Acct. Problems	3	ACCT 407 Accounting Research	1
ACCT 404 Individual Taxation	3	ACCT 411 Financial Acct. Problems	3
or ACCT 405 Corporate Taxation	3	MGT 415 Business Strategy	3
ACCT 415 Auditing	3	Accounting Requirement ⁵	3
Accounting Requirement ⁵	3	Elective ³	6
Elective	3		16
	15		

127 Total Semester Hours

¹Either MTHSC 102 or 106 and either MTHSC 207 or 108 may be taken to satisfy the freshman mathematics requirements. Use elective credits to satisfy the difference in hours.

²Select from SOC 201, PSYCH 201 and either POSC 101 or 201.

³Elective credits may be taken in any combination of 1-, 2-, 3-, or 4-hour courses, but see footnote 1 above.

⁴ENGL 202, 203, 204, 205, 206, 207, 208, 209 or a foreign language literature at the 300-level or higher

⁵ACCT 403, 404, 405, 410, 416, 425, 430.

⁶Any 3-hour course in English or history

Notes:

1. Accounting majors are required to earn a grade of C or higher in all prerequisite accounting courses in order to be eligible for enrollment in the next higher-level accounting course.

2. MTHSC 101 and 105 may not be counted in computing the minimum number of credit hours required for graduation with a BS in Accounting degree.

ECONOMICS

A bachelor's degree in Economics provides a thorough understanding of the economic system and prepares the student for a broad choice of career opportunities. By combining general education courses, a minor or option, and a strong major in economics, students can prepare themselves for specialized graduate studies and careers in business and government.

The Department of Economics offers two degree paths for the undergraduate. The Bachelor of Arts degree is distinguished by its emphasis on the language skills and the humanities. A broad choice of minors is available for this program. The Bachelor of Science program emphasizes quantitative skills and particular preparations for careers in business and offers a structured selection of options.

BACHELOR OF ARTS IN ECONOMICS**FRESHMAN YEAR**

First Semester		Second Semester	
CPSC 110 Elem. Comp. Prog.	3	ENGL 102 Composition II	3
or CPSC 120 Intro. to Inf. Proc. Sys.	3	HIST 172 Western Civilization	3
ENGL 101 Composition I	3	MTHSC 101 Finite Probability ¹	3
MTHSC 102 Intro. to Math. Analysis ¹	3	Modern Language ⁶	4
Modern Language ⁶	4	Science Requirement ²	4
Science Requirement ²	4	Elective	1
Elective	1		18
	18		

SOPHOMORE YEAR

ECON 211 Principles of Economics	3	ECON 212 Principles of Economics	3
HIST 173 Western Civilization	3	MTHSC 207 Multivariable Calculus ¹	3
MTHSC 203 Elem. Stat. Inference ¹	3	Literature Requirement ³	3
Literature Requirement ³	3	Modern Language ⁶	3
Modern Language ⁶	3	Social Science Requirement ⁴	3
Elective	1	Elective	2
	16		17

JUNIOR YEAR

ACCT 200 Basic Accounting	3	ECON 407 National Income and	
or ACCT 201 Principles of Acct.	3	Employment Analysis	3
ECON 314 Inter Econ. Theory	3	Social Science Requirement ⁴	3
ENGL 304 Business Writing	3	Major ⁵	3
or SPCH 205 Public Speaking	3	Minor	6
Major ⁵	3		
Minor	3		15
	<u>15</u>		

SENIOR YEAR

Major ⁵	6	Major ⁵	6
Minor	3	Elective	10
Elective	3		16
	<u>15</u>		

130 Total Semester Hours

¹The sequence MTHSC 101, 102, 203, 207 may be replaced either by MTHSC 102, 207, 210, 301, or 106, 207, 210, 301²Two courses, totaling eight hours, in the same science are required³ENGL 202, 203, 204, 205, 206, 207, 208, 209⁴See page 53.⁵Twenty-four semester hours in economics above the sophomore level are required, including ECON 314 and 407. ECON 101 and 203 do not count toward the major. Major credit may include up to 6 hours selected from HIST 306, IE 484, MGT 406. (Those seeking teaching certification will be required to complete more than 130 semester hours.)⁶Two years of the same language are required.**MINOR CONCENTRATION**

Any minor approved by the College of Liberal Arts, including the Cluster Minor, and any minor concentration offered by any other department in the College of Commerce and Industry is acceptable as a minor for the Bachelor of Arts curriculum in Economics.

Students who wish to combine the curriculum in Economics with secondary school teaching should elect to take the degree in Education with a teaching area in Economics. The courses will be those required for teaching certification as specified by the South Carolina Department of Education as well as those required for an Economics major. Requirements for a major in Education with a teaching area in Social Sciences are shown under the College of Education.

A minor in Economics is provided for other degree programs consisting of 15 hours above the sophomore level which must include ECON 314 and 407.

BACHELOR OF SCIENCE IN ECONOMICS**FRESHMAN YEAR**

First Semester		Second Semester	
ACCT 201 Principles of Accounting	3	ACCT 202 Principles of Accounting	3
ENGL 101 Composition I	3	ENGL 102 Composition II	3
HIST 172 Western Civilization	3	HIST 173 Western Civilization	3
MTHSC 106 Calculus of One Variable ¹	4	MTHSC 207 Multivariable Calculus ¹	3
Science Requirement ²	4	Science Requirement ²	4
	<u>17</u>	Elective	1
			<u>17</u>

SOPHOMORE YEAR

CPSC 110 Elem. Comp. Prog.	3	ECON 212 Principles of Economics	3
or CPSC 120 Intro. to Inf. Proc. Sys. ⁴	3	FIN 306 Corporation Finance ¹⁴	3
ECON 211 Principles of Economics	3	MTHSC 210 Applied Matrix Alg. ¹	3
MTHSC 301 Stat. Theory and Meth. ¹	3	Literature Requirement ³	3
Literature Requirement ³	3	Social Science Requirement ¹⁵	3
Social Science Requirement ¹⁵	3	Elective	1
Elective	1		16
	<u>16</u>		

JUNIOR YEAR

ECON 314 Inter. Econ. Theory	3	ECON 407 National Income and	
LAW 322 Legal Envir. of Bus. ⁷	3	Employment Analysis	3
or LAW 312 Commercial Law	3	ENGL 304 Business Writing	3
Major ⁶	3	or SPCH 250 Public Speaking	3
Option	3	Major ⁶	3
Elective	4	Option	3
	16	Elective	3
			15

SENIOR YEAR

Major ⁶	6	Major ⁶	6
Option	6	Option	3-5
Elective	6	Elective	6-8
	18		17

132 Total Semester Hours

OPTIONS

Rather than having a minor or secondary concentration as in the Bachelor of Arts program in Economics, a student in the Bachelor of Science program selects one of several options. These options generally consist of 15 hours of a certain core of study. It is felt that these options might be particularly appealing to certain students with definite vocational interests. Also, an appropriately chosen option would greatly facilitate moving into a Master of Business Administration program in graduate school or law school.

Students enrolling in the Bachelor of Science program in Economics may select from the following options.

Accounting⁷

ACCT 301 Intermediate Accounting	3	Management Science⁷	
ACCT 302 Intermediate Accounting	3	ACCT 303 Cost Accounting	3
ACCT 303 Cost Accounting	3	or ACCT 404 Individual Taxation	3
and ACCT 404 Individual Taxation	3	or LAW 313 Commercial Law	3
or ACCT 411 Fin. Acct. Prob.	3	ECON (MASC) 311 Intro. to Econometrics	3
and ACCT 415 Auditing	3	MASC 413 Management Sci. I	3
LAW 313 Commercial Law	3	Quantitative Requirement ⁸	6
	15		15

Computer Science

Select at least 15 hours from the following:		Mathematical Sciences—Statistics	
ECON (MASC) 311 Intro. to		ECON 430 Math. Economics	3
Econometrics	3	ECON (MASC) 311 Intro. to	
MGT 299 Computer Utilization I	1	Econometrics	3
MGT 418 Management Inform. Sys.	3	MTHSC 311 Linear Algebra	3
and MGT 399 Mgt. Applications		MTHSC 405 Stat. Theory and Meth. II	3
of Microcomputers	2	MTHSC 440 Linear Programming	3
Computer Science Requirement ¹⁰	—		15

Environmental Studies

AGEC 403 Land Economics	3	Public Administration⁹	
BOT 145 Environmental Dynamics	2	Select 15 hours from the following:	
CRD 357 Nat. Res. Economics	3	POSC 302 State and Local Gov't.	3
ENSC 471 Man and His Environ.	2	POSC 321 Gen. Public Admin.	3
ENSC 472 Environ. Plan. and Cont.	2	POSC 422 Gov't. Policy and Pol. Economy	3
FOR 304 Forest Economics	3	POSC 423 Urban Politics	3
	15	POSC 425 Money, Budgets, and Grantsman	3
		POSC 427 Public Personnel Management	3
			18

Social Science

HIST 306 Amer. Econ. Develop	3	Textile Science	
POSC 321 Gen. Public Admin.	3	TEXT 175 Intro. to Textile Mfg.	3
or POSC 361 Inter. Politics	3	TEXT 201 Yarn Structures and Formation	4
SOC 330 Industrial Sociology	3	TEXT 202 Fabric Structures, Design,	
Elective ⁵	6	and Analysis	4
	15	TEXT 314 Chemical Processing of Textiles	4
		TEXT 475 Textile Marketing	3
			18

International Management¹¹

MGT 301 Principles of Management	3
MGT 400 Mgt. of Org. Behavior	3
or MGT 415 Business Strategy	3
or MGT 423 Intl. Bus. Mgt.	3
POSC 361 International Politics	3
Modern Language ¹²	8
	<u>17</u>

Law and Economics⁷

ECON 309 Government and Business	3
or ECON 420 Public Sector Econ.	3
or ECON 424 The Org. of Industries	3
LAW 312 Commercial Law	3
LAW 313 Commercial Law	3
LAW 402 Law and Economics	3
POSC 432 American Constitutional Law I	3
	<u>15</u>

Finance¹⁴

FIN 312 Financial Management II	3
Finance Electives ¹⁶	12
	<u>15</u>

Marketing

MKT 301 Principles of Marketing	3
MKT 402 Consumer Behavior	3
MKT 431 Marketing Research	3
Marketing Elective ¹³	6
	<u>15</u>

¹The sequence of MTHSC 106, 207, 210, 301 may be replaced by MTHSC 102, 207, 210, 301 or 101, 102, 203, and 207.

²Two courses, totaling 8 credits in the same science, are required.

³ENGL 202, 203, 204, 205, 206, 207, 208, 209.

⁴CPSC 110 should be selected for the Computer Science and Mathematical Sciences-Statistics options. CPSC 120 should be selected for the Management Science and Accounting options.

⁵Select from 300- and 400-level courses in geography, history, political science, psychology, and sociology.

⁶Twenty-four hours in economics above the sophomore level are required including ECON 314 and 407. ECON 101 and 203 do not count toward the major. Major credit may include up to 6 credits selected from HIST 306, IE 384, MGT 406.

⁷Students in either the Accounting or the Management Science option should select LAW 312 in lieu of LAW 322 in the junior year, while those in the Law and Economics option are required to take LAW 322.

⁸Select from ECON 430, ECON (MGT) 409, MASC 414, MTHSC 405.

⁹Students in the Public Administration option are required to take POSC 101 and 201; ECON 309 and 420 are to be included in the major.

¹⁰Select from any 200-, 300- and 400-level computer science courses.

¹¹Students in the International Management option are required to take POSC 101, 201; ECON 412 is to be included in the major.

¹²Two semesters of the same language are required.

¹³Select from AGEC 351 or any 400-level marketing course.

¹⁴Students in the Finance option should select FIN 311 in lieu of FIN 306 during the sophomore year.

¹⁵See page 53, and footnotes 9 and 11 above.

¹⁶Select from 300- and 400-level finance courses.

FINANCIAL MANAGEMENT

The degree program for the Bachelor of Science in Financial Management is accredited by the American Assembly of Collegiate Schools of Business. The curriculum provides the student with a course of study in preparation for a career in such areas as corporate finance, banking, insurance, brokerage, real estate financing, and investment services. The student should be well prepared to serve on the financial staff of practically any business firm for the purpose of planning, providing, and controlling the capital of the firm. This curriculum should also prepare the student for service with government agencies and programs. The graduate with this degree should be well prepared for entrance into Master of Business Administration, Law, or other graduate programs.

FRESHMAN YEAR

First Semester		Second Semester	
ECON 211 Principles of Economics	3	CPSC 120 Intro. to Info. Process Sys.	3
ENGL 101 Composition I	3	ECON 212 Principles of Economics	3
MTHSC 102 Intro. to Math Anal ¹	3	ENGL 102 Composition II	3
Laboratory Science Requirement ²	4	MTHSC 207 Multivariable Calculus ¹	3
Social Science Requirement ²	3	Laboratory Science Requirement ²	4
Elective	1		<u>16</u>
	<u>17</u>		

SOPHOMORE YEAR

ACCT 201 Principles of Accounting	3	ACCT 202 Principles of Accounting	3
LAW 312 Commercial Law	3	ENGL 304 Business Writing	3
MTHSC 301 Stat. Theory and Meth. I	3	MASC 310 Intro. to Management Science	3
Literature Requirement ³	3	PSYCH 201 Introduction to Psychology	3
Elective	3	Humanities Requirement ²	3
	<u>15</u>	Elective	3
			<u>18</u>

JUNIOR YEAR

ACCT 301 Intermediate Accounting	3	ACCT 302 Intermediate Accounting	3
ECON 302 Money and Banking	3	FIN (ECON) 305 Investment Analysis	3
FIN 311 Financial Management I	3	FIN 307 Principles of Real Estate	3
MGT 301 Principles of Management	3	FIN 308 Financial Institutions and Mkts.	3
SPCH 250 Public Speaking	3	FIN 312 Financial Management II	3
	<u>15</u>		<u>15</u>

SENIOR YEAR

FIN (ECON) 304 Risk and Insurance	3	MGT 415 Business Strategy	3
MGT 402 Product and Operat. Mgt. I	3	Concentration Area ⁵	9
MKT 301 Principles of Marketing	3	Elective	3
Accounting Elective ⁴	3		<u>15</u>
Concentration Area ⁵	6		
	<u>18</u>		

129 Total Semester Hours

¹ Credits earned in MTHSC 106 and 108 may be substituted for MTHSC 102 and 207, respectively, and 1 or 2 elective hours.

² See General Education Requirements.

³ ENGL 202, 203, 204, 205, 206, 207, 208, 209, or 300-level foreign language literature

⁴ Accounting electives may be selected from any 300- or 400-level course offered by the School of Accountancy.

⁵ Credit may not be received for both ACCT 303 and 307.

⁵ Select fifteen semester hours from one of the following Concentration Areas along with its corresponding courses. A Concentration Area should be selected by the end of the second semester of the student's Junior year in consultation with adviser.

Accounting FIN 402, 404, and three Accounting Electives (See footnote 4.)

Corporate Finance FIN 402, 404, 406 or 411, and two Business Electives (See note 3 below.)

Financial Institutions FIN 405, 408, 406 or 407, and two Business Electives (See note 3 below.)

International Finance ACCT 403, ECON 412, FIN 406, 411, MGT 423

Real Estate AGECE 413, FIN 407, FIN 405 or LAW 333, and two Business Electives. (See note 3 below.)

Notes:

1) Financial Management majors are required to have a grade-point ratio of at least 2.0 in all FIN-designated courses in order to graduate. Only the last grade for courses that are repeated counts for computing the required grade-point ratio. MTHSC 101 may not be used as elective credit toward requirements for graduation with a BS in Financial Management.

2) No more than 60 percent of coursework may be taken in the College of Commerce and Industry.

3) Business Electives may be selected from any 300- or 400-level course offered by the College of Commerce and Industry or from any computer science course.

INDUSTRIAL MANAGEMENT

The Bachelor of Science degree in Industrial Management is designed primarily to prepare students for management challenges in the areas of manufacturing, production planning, inventory control, quality assurance, and service operations. Industrial management students receive a broad-based education in business, but particular emphasis is placed on systems, theories, and issues dealing with the production of goods and services. The Industrial Management program is particularly relevant in today's economic environment, where improvements in productivity and quality are essential to meet the growing challenges of foreign producers in many industries. In addition to jobs in manufacturing management, graduates of the Industrial Management program are sometimes sought for positions as project directors by various government agencies and research centers. Banks and financial institutions have found the in-

dustrial management graduate well prepared for internal operations management as well as for liaison positions dealing with manufacturing companies as bank customers. The program also provides an excellent background for students interested in careers as technical sales representatives. The Industrial Management program is accredited by the American Assembly of Collegiate Schools of Business.

FRESHMAN YEAR

First Semester		Second Semester	
ECON 211 Principles of Economics	3	CPSC 120 Intro. to Infor. Proc. Sys.	3
ENGL 101 Composition I	3	ECON 212 Principles of Economics	3
MTHSC 106 Calculus of One Variable I	4	ENGL 102 Composition II	3
Science Requirement ¹	4	MTHSC 108 Calculus of One Variable II	4
Social Science Requirement ²	3	Science Requirement ¹	4
	<u>17</u>		<u>17</u>

SOPHOMORE YEAR

ACCT 201 Principles of Accounting	3	ACCT 202 Principles of Accounting	3
MGT 299 Computer Utilization I	1	LAW 322 Legal Environ. of Business	3
MTHSC 301 Stat. Theory and Meth. I	3	MASC 310 Intro. to Management Science	3
Literature Requirement ³	3	MGT 399 Mgt. App. of Microcomputers	2
Elective	6	SPCH 364 Organizational Communication	3
	<u>16</u>	Elective	2
			<u>16</u>

JUNIOR YEAR

ACCT 307 Managerial Accounting	3	FIN 306 Corporation Finance	3
ENGL 304 Business Writing	3	MASC 413 Management Science I	3
or ENGL 314 Technical Writing	3	MGT 307 Personnel Management	3
IE 364 Design and Meas. of Work	3	MGT 418 Mgt. Infor. Systems	3
MGT 301 Principles of Management	3	PHIL 344 Business Ethics	3
MKT 301 Principles of Marketing	3	Advised Concentration ⁴	3
Elective	2		<u>18</u>
	<u>17</u>		

SENIOR YEAR

ECON (MGT) 409 Managerial Economics	3	MGT 404 Adv. Stat. Qual. Control	3
MASC 414 Statistical Analysis	3	MGT 408 Prod. and Ops. Mgt. II	3
MGT 400 Mgt. of Org. Behavior	3	MGT 415 Business Strategy	3
MGT 402 Prod. and Op. Mgt. I	3	MGT 423 International Business Mgt.	3
MGT 405 Economics of Transportation	3	MGT 430 Senior Seminar in Mgt	3
or MGT 417 Logistics Management	3	Advised Concentration Area ⁴	3
Advised Concentration Area ⁴	3		<u>18</u>
	<u>18</u>		

137 Total Semester Hours

¹A two-semester sequence in the same physical or biological science, each including a laboratory

²Select from anthropology, economics (including crosslisted agricultural economics courses), geography, history, political science, psychology, or sociology (including crosslisted rural sociology courses)

³Select from sophomore literature courses (200-level only) or foreign language literature courses (300-level or higher).

⁴Minimum of 9 semester hours, beyond required courses, in an approved area of concentration. Approved areas of concentration, and specific courses within the area, are available through the Department of Management

MANAGEMENT

The Bachelor of Science degree in Management is designed to prepare students for careers as professional managers in corporations, governmental organizations, and small businesses. In addition, the program provides a foundation for graduates who wish to pursue advanced degrees in business and public administration, law, and the social sciences. The curriculum gives the student a broad exposure to the functional areas of business and allows each to select an area of concentration in a subject that is germane to individual career interests.

The Management curriculum provides (1) an examination of the social, legal, political, and economic environments in which organizations must operate; (2) an understanding of the functional areas of business and their interrelationships; and (3) a knowledge of behavioral science, applied statistics, and mathematics as they relate to organizational problem solving. The program is accredited by the American Assembly of Collegiate Schools of Business.

FRESHMAN YEAR

First Semester		Second Semester	
ECON 211 Principles of Economics	3	CPSC 120 Intro. to Inform. Proc. Sys.	3
ENGL 101 Composition I	3	ECON 212 Principles of Economics	3
MTHSC 102 Intro. to Math. Analysis	3	ENGL 102 Composition II	3
PSYCH 201 Introduction to Psychology	3	MTHSC 207 Multivariable Calculus	3
or SOC 201 Intro. to Sociology	3	Science Requirement ¹	4
Science Requirement ¹	4		16
	16		

SOPHOMORE YEAR

ACCT 201 Principles of Accounting	3	ACCT 202 Principles of Accounting	3
MGT 299 Computer Utilization I	1	LAW 322 Legal Environment of Business	3
MTHSC 301 Stat. Theory and Meth. I	3	MASC 310 Intro. to Mgt. Science	3
Economics Requirement ³	3	MGT 399 Mgt. Application of	
Literature Requirement ²	3	Microcomputers	2
Elective	3	Elective	4
	16		15

JUNIOR YEAR

ACCT 307 Managerial Accounting	3	ENGL 304 Business Writing	3
MASC 312 Dec. Models for Mgt.	3	or ENGL 314 Technical Writing	3
MGT 301 Principles of Management	3	FIN 306 Corporation Finance	3
MKT 301 Principles of Marketing	3	MGT 307 Personnel Management	3
PHIL 344 Business Ethics	3	SPCH 364 Organizational Communication	3
Elective	2	Area Concentration ⁴	3
	17	Elective	1
			16

SENIOR YEAR

MGT 402 Prod. and Op. Mgt. I	3	MGT 400 Mgt. of Organizational Behav	3
MGT 418 Management Info. Sys.	3	MGT 408 Prod. and Operations Mgt. II	3
MGT 423 International Business		MGT 415 Business Strategy	3
Management	3	MGT 430 Senior Seminar in Management	3
Area Concentration ⁴	9	Area Concentration ⁴	3
	18		15

129 Total Semester Hours

¹A two-semester sequence in the same physical or biological science, each including a laboratory

²Select from sophomore literature courses (200-level only) or foreign language literature courses (300-level or higher).

³Select from ECON 301, 302, 308, 309, 314, or 412

⁴Fifteen semester hours, beyond required courses, in any 300- or 400-level course in the College of Commerce and Industry, Department of Industrial Engineering, or Department of Computer Science. Specific recommendations are available through the departments of Management, Accounting, Economics, Finance, Marketing, Textiles, Computer Science, and Industrial Engineering. Students should select their area of concentration as soon as possible.

MARKETING

The Bachelor of Science degree in Marketing is designed to provide students with a broad knowledge of the various aspects of the marketing profession. By combining general education courses, various business classes from management, economics, finance, and accounting, and core of marketing curricula, the degree prepares students for a variety of marketing responsibilities and choices of industry and governmental career paths. The curriculum addresses such marketing functions as sales

and retail management, marketing research, industrial marketing, and marketing communication, and it is intended to provide the conceptual, quantitative, and analytical skills that will be necessary in a challenging economic environment.

FRESHMAN YEAR

First Semester		Second Semester	
ECON 211 Principles of Economics	3	CPSC 120 Intro. to Inf. Proc. Sys.	3
ENGL 101 Composition I	3	ECON 212 Principles of Economics	3
MTHSC 102 Intro. to Math. Analysis	3	ENGL 102 Composition II	3
PSYCH 201 Intro. to Psychology	3	MTHSC 207 Multivariable Calculus	3
or SOC 201 Intro. to Sociology	3	Science Requirement ¹	4
Science Requirement ¹	4		16
	16		

SOPHOMORE YEAR

ACCT 201 Principles of Accounting	3	ACCT 202 Principles of Accounting	3
MGT 299 Computer Utilization I	1	LAW 322 Legal Environ. of Business	3
MTHSC 301 Stat. Theory and Meth. I	3	MASC 310 Intro. to Mgt. Science	3
Economics Requirement ²	3	MGT 399 Mgt. Application of Microcomp.	2
Literature Requirement ³	3	Elective	4
Elective	3		15
	16		

JUNIOR YEAR

ACCT 307 Managerial Accounting	3	FIN 306 Corporate Finance	3
ENGL 304 Business Writing	3	MGT 307 Personnel Management	3
or ENGL 314 Technical Writing	3	MKT 402 Consumer Behavior	3
MASC 312 Dec. Mod. for Management	3	MKT 431 Marketing Research	3
MGT 301 Principles of Management	3	SPCH 364 Organizational Communication	3
MKT 301 Principles of Marketing	3	Elective	1
Elective	2		16
	17		

SENIOR YEAR

MGT 402 Prod. and Ops. Mgt. I	3	MGT 400 Mgt. of Organ. Behavior	3
MGT 418 Management Info. Sys.	3	MGT 415 Business Strategy	3
MGT 423 International Bus. Mgt.	3	MKT 450 Marketing Management	3
or MKT 427 International Markets	3	College Elective ⁵	3
PHIL 344 Business Ethics	3	Marketing Elective ⁴	3
Marketing Elective ⁴	6		15
	18		

129 Total Semester Hours

¹A two-semester sequence in the same physical or biological science, each including a laboratory

²ECON 301, 302, 308, 309, 314, 412

³Select from sophomore literature courses (200-level only) or foreign language literature courses (300-level or higher).

⁴Any 400-level marketing course

⁵Any 300- or 400-level course from the College of Commerce and Industry with the exception of the required courses

TEXTILE CHEMISTRY, TEXTILE MANAGEMENT, AND TEXTILE SCIENCE PROGRAMS

The textile student studies the production of fibers by man and nature, the processes for converting these fibers into a textile structure, the science of the addition of coloring agents and finishes to improve the desirability and the test methods for evaluating the performance of textile products.

Graduates of the School of Textiles hold jobs with responsibilities in corporate management, sales, manufacturing management, design, research, development, technical service, quality control, and personnel management. They create new products and processes and solve problems. They create styles, patterns, textures, and colors for apparel,

home, and industrial use as well as special application. They deal with computers, automation, product quality, plant performance, environmental control, and consumer safety.

The textile industry has a continuing need for technically trained men and women to help it meet sociologically desirable standards such as those required by the Occupational Safety and Health Act, the Consumer Product Safety Commission, and the Environmental Protection Agency. In addition, there is a need to reduce costs and increase exports, and to develop new fibers and fabrics for apparel and new industrial applications as well as fiber-reinforced composite materials. In the textile curricula a broad background is stressed, with as much as two-thirds of the courses coming from the large resources of the University outside the School of Textiles.

The School of Textiles offers three undergraduate degrees which differ in the content of science and business courses. The BS in Textile Chemistry and the BS in Textile Science are both based on the three sciences: chemistry, physics, and mathematics. With this firm base, the graduate is able to apply scientific knowledge to the solution of problems involving both chemical and physical principles. The graduate will be concerned with the conception, design, construction, and management of complete systems of labor, machinery and processes for the most efficient production of textiles or related chemicals. These two courses differ in that Textile Chemistry has a greater emphasis on chemistry and Textile Science has greater emphasis on yarn and fabric formation. Both curricula prepare one for graduate study in textiles.

The Bachelor of Science in Textile Management provides the student with a balanced combination of the principles and theories of textile manufacturing and management, as well as concentrated studies in related options of the student's choice. This program is designed to prepare students for a career in the modern industrial environment and may initially lead to a production management position in the textile industry.

Today's textile graduate must be able to meet the current and anticipated needs of the rapidly changing modern textile industry and also be knowledgeable about the suppliers and users of textile-related materials and equipment. This plan of study maximizes students' leadership potential and professional development in their chosen field.

The School of Textiles also offers advanced degrees as follows: Master of Science in Textile Chemistry, Master of Science in Textile Science, Doctor of Philosophy in Textile and Polymer Science, and in cooperation with the Chemistry Department, the Doctor of Philosophy in Chemistry with a major in Textile Chemistry.

Textile courses also may be taken as a minor area or as free electives. Recommended groups of courses may consist of 3, 6, 12, or 20 credits.

Note: No curriculum in the School of Textiles leading to the Bachelor of Science degree will allow credit for ENGL 100 or MTHSC 105 to be used to satisfy requirements for graduation.

TEXTILE CHEMISTRY**FRESHMAN YEAR**

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I	4	MTHSC 108 Calculus of One Variable II	4
TEXT 175 Intro. to Textile Manufacturing	3	PHYS 122 Phys. with Calculus I	3
History Requirement ¹	3	Elective	3
	<u>17</u>		<u>17</u>

SOPHOMORE YEAR

CH 223 Organic Chemistry	3	CH 224 Organic Chemistry	3
CH 225 Organic Chemistry Lab.	2	CH 226 Organic Chemistry Lab.	2
MTHSC 206 Calculus of Sev. Var.	4	MTHSC 208 Intro. to Ord. Diff. Equa.	4
PHYS 221 Phys. with Calculus II	3	PHYS 222 Phys. with Calculus III	3
PHYS 223 Physics Lab. II	1	PHYS 224 Physics Lab. III	1
Literature Requirement ²	3	Humanities Requirement ³	3
	<u>16</u>		<u>16</u>

JUNIOR YEAR

CH 331 Physical Chemistry	3	CH 332 Physical Chemistry	3
ECON 200 Economic Concepts	3	ENGL 314 Technical Writing	3
TC 315 Intro. to Polymer Science and Engineering	3	TC 316 Chem. Prep. of Text.	3
TC 317 Polymer and Fiber Lab.	1	TEXT 202 Fabric Structure, Design, and Analysis	4
TEXT 201 Yarn Structure and Form.	4	Elective	4
Elective	3		<u>17</u>
	<u>17</u>		

SENIOR YEAR

TC 457 Dyeing and Finishing I	3	TC 458 Dyeing and Finishing II	3
TC 459 Dyeing and Finishing Lab. I	1	TC 460 Dyeing and Finishing Lab. II	1
TEXT 321 Fiber Science	3	TEXT 322 Prop. of Textile Structures	3
Elective	9	Elective	9
	<u>16</u>		<u>16</u>

132 Total Semester Hours

¹HIST 101, 102, 172, 173.²ENGL 202, 203, 204, 205, 206, 207, 208, 209³See page 53**TEXTILE MANAGEMENT****FRESHMAN YEAR**

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 102 General Chemistry	4
ENGL 101 Composition I	3	CPSC 110 Elem. Comp. Prog.	3
MTHSC 102 Intro. to Math. Analysis	3	or CPSC 120 Intro. to Info. Processing Systems	3
TEXT 175 Intro. to Textile Mfg.	3	ENGL 102 Composition II	3
History Requirement ¹	3	MTHSC 207 Multivariable Calculus	3
	<u>16</u>	TEXT 176 Natural and Manmade Fibers	4
			<u>17</u>

¹HIST 101, 102, 172, 173**CHEMICAL OPTION****SOPHOMORE YEAR**

ACCT 201 Principles of Accounting	3	ACCT 202 Principles of Accounting	3
PSYCH 201 Introduction to Psychology	3	MGT 301 Principles of Management	3
TEXT 201 Yarn Structures and Form.	4	TEXT 202 Fabric Structure, Design, and Analysis	4
TEXT 324 Textile Statistics	3	Literature Requirement ²	3
Textile Option ¹	4	Textile Option ¹	4
	<u>17</u>		<u>17</u>

JUNIOR YEAR

ECON 211 Principles of Economics	3	ECON 212 Principles of Economics	3
FIN 306 Corporation Finance	3	ENGL 314 Technical Writing	3
LAW 322 Legal Environ. of Business	3	MGT 307 Personnel Management	3
MKT 301 Principles of Marketing	3	Area Concentration ³	3
Area Concentration ³	3	Textile Option ¹	4
	<u>15</u>		<u>16</u>

SENIOR YEAR

TEXT 470 Textile Costing and Inventory Control	3	MGT 415 Business Strategy	3
Area Concentration ³	3	Area Concentration ³	3
Humanities Requirement ⁴	3	Textile Option ¹	3
Textile Option ¹	6	Elective	7
Elective	3		<u>16</u>
	<u>18</u>		

132 Total Semester Hours

¹Textile Option TC 303, 304, 305, 306, 316, 405, 406, 457, 459, TEXT 322, 416, 428, 429²ENGL 202, 203, 204, 205, 206, 207, 208, 209³Area Concentrations A minimum of 12 credits must be selected with at least 9 credits from any one of the following area concentrations:

Personnel ECON 301, 308, LAW 312, 313, 401, MGT 400, 416

Markets and Marketing ECON 314, 412, MKT 402, 423, 424, 426, 431, 450, TEXT 472

Industrial Engineering EG 109, IE 306, MGT 402, 408

Science TC 303/305, 304/306, MTHSC 106, 108, 206, 208, PHYS 122, 221, 222, 223, 224.

Computer Science CPSC 130, 210, 230, 240, 330, 360, 462, ECE 425, MGT 299, 399, MTHSC 219, TEXT 203, 420.

⁴See page 53**MANUFACTURING OPTION**

See page 98 for Freshman year.

SOPHOMORE YEAR**First Semester**

ACCT 201 Principles of Accounting	3
ECON 211 Principles of Economics	3
PSYCH 201 Introduction to Psychology	3
TEXT 201 Yarn Structure and Form.	4
TEXT 324 Textile Statistics	3
	<u>16</u>

Second Semester

ACCT 202 Principles of Accounting	3
ECON 212 Principles of Economics	3
MGT 301 Principles of Management	3
TEXT 202 Fabric Structures, Design, and Analysis	4
Literature Requirement ¹	3
	<u>16</u>

JUNIOR YEAR

FIN 306 Corporation Finance	3	ENGL 314 Technical Writing	3
LAW 322 Legal Environ. of Business	3	MGT 307 Personnel Management	3
MKT 301 Principles of Marketing	3	Area Concentration ²	3
TEXT 308 Apparel	4	Textile Option ³	5
Area Concentration ²	3	Elective	3
	<u>16</u>		<u>17</u>

SENIOR YEAR

TEXT 470 Textile Costing and Inventory Control	3	MGT 415 Business Strategy	3
Area Concentration ²	3	Area Concentration ²	3
Humanities Requirement ⁴	3	Textile Option ³	6
Textile Option ³	6	Elective	4
Elective	3		<u>16</u>
	<u>18</u>		

132 Total Semester Hours

¹ENGL 202, 203, 204, 205, 206, 207, 208, 209²Area Concentrations A minimum of 12 credits must be selected with at least 9 credits from any one of the following area concentrations

Personnel ECON 301, 308, LAW 312, 313, 401, MGT 400, 416

Markets and Marketing ECON 314, 412, MKT 402, 423, 424, 426, 431, 450, TEXT 472.

Industrial Engineering EG 109, IE 306, MGT 402, 408

Science TC 303/305, 304/306, MTHSC 106, 108, 206, 208, PHYS 122, 221, 222, 223, 224

Computer Science CPSC 130, 210, 230, 240, 330, 360, 462, ECE 425, MGT 299, 399, MTHSC 219, TEXT 203, 420.

³Textile Option to be selected from the following TEXT 314, 322, 403, 411, 416, 426, 428, 429, 471.⁴See page 53

TEXTILE SCIENCE**FRESHMAN YEAR**

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 102 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I	4	MTHSC 108 Calculus of One Variable II	4
TEXT 175 Intro. to Textile Mfg.	3	PHYS 122 Physics with Calculus I	3
History Requirement ¹	3	Elective	3
	<u>17</u>		<u>17</u>

SOPHOMORE YEAR

MTHSC 206 Calculus of Several Var.	4	ECON 200 Economic Concepts	3
PHYS 221 Phys. with Calculus II	3	MTHSC 208 Intro. to Ord. Diff. Equa.	4
PHYS 223 Physics Lab. II	1	PHYS 222 Phys. with Calculus III	3
TEXT 301 Fiber Processing I	3	PHYS 224 Physics Lab. III	1
Literature Requirement ²	3	TEXT 302 Fiber Processing II	3
Elective	1	Elective	3
	<u>15</u>		<u>17</u>

JUNIOR YEAR

TC 303 Textile Chemistry	3	ENGL 314 Technical Writing	3
TC 305 Textile Chemistry Lab.	1	TC 304 Textile Chemistry	3
TEXT 311 Fabric Development I	3	TC 306 Textile Chemistry Lab.	1
TEXT 321 Fiber Science	3	TEXT 312 Fabric Development II	3
Humanities Requirement ³	3	TEXT 322 Properties of Text. Structures	3
Elective ⁴	5	Elective	3
	<u>18</u>		<u>16</u>

SENIOR YEAR

TC 315 Introduction to Polymer Science and Engineering	3	TC 457 Dyeing and Finishing I	3
TC 317 Polymer and Fiber Lab.	1	TC 459 Dyeing and Fin. Lab. I	1
TEXT 403 Fiber Processing III	3	TEXT 414 Nonwoven and Knitted Structures	3
TEXT 411 Fabric Development III	3	Elective ⁴	9
Elective ⁴	6		<u>16</u>
	<u>16</u>		

132 Total Semester Hours

¹HIST 101, 102, 172, 173.²ENGL 202, 203, 204, 205, 206, 207, 208, 209.³See page 53.⁴See adviser for list of approved electives.**MINOR CONCENTRATION**

Textiles A minor in Textiles requires 15 credits from the following: TEXT 175 or 460, 201, 202; any other approved textile courses such as TEXT 308, 314, 416, 420, 426, 428, 440, 470, 471, 472, 475, 476.

COLLEGE OF EDUCATION

The purpose of the College of Education is to prepare teachers, special services personnel, and school leaders; to provide professional services to education in South Carolina; and to carry out basic and applied research in education. Curricula are organized to give students the opportunities to (1) acquire a broad general education through liberal arts and science courses; (2) develop depth of knowledge in the teaching area; (3) gain an understanding of the historical, philosophical and psychological backgrounds of American education; and (4) acquire knowledge of and skill and experience in using effective teaching techniques.

Curricula for those preparing to teach have been especially designed by committees from each department offering a teaching major and the College of Education.

ADMISSION

Admission to teacher education programs in the College of Education is accomplished in three phases: preprofessional, professional, and directed teaching.

Preprofessional Individuals who show an interest in teaching and related areas and who have met the general admission requirements of Clemson University must complete and submit a College of Education application form to be considered for admission to a preprofessional program. These forms are available in all Education departments.

Professional During the term in which a student is to complete 60 semester hours of work, he/she must have a minimum cumulative grade-point ratio of 1.8, successfully complete the Basic Skills Education Entrance Examination (EEE), and apply on the College of Education form for admission to a professional program. For undergraduate students who enter Clemson after May 15, 1986, the minimum grade-point ratio is 2.5 or a cumulative grade-point ratio of 2.0 and evidence of a score above the 50th percentile of examinees in South Carolina taking the SAT in the year of graduation from high school. The professional education admission application is to be submitted to the department head by November 10, March 1, or at the beginning of the summer term in which the student will have completed 60 semester hours. A student who has not passed the EEE may be conditionally admitted to a teacher education program for a period not to exceed one year. Students will be allowed to take the examination no more than three times. Students who fail to meet the EEE requirement within one year of the date of conditional admission will be dropped from the program.

Directed Teaching A student who is in a professional program and who has completed at least 95 semester hours is eligible to register for the appropriate directed teaching program. A student should apply to the head of his/her department prior to May 1 of the academic year preceding the school year in which directed teaching is to be scheduled. The cumulative grade-point average necessary for graduation is required prior to being permitted to register for directed teaching and the related methods courses.

A student must arrange for his/her National Teacher Examination score report to be furnished to the College of Education and the South

Carolina Department of Education prior to registering for directed teaching. A score report must be received for each examination required by the South Carolina State Board of Education (specialty area and professional knowledge).

CONTINUING ENROLLMENT

A student must maintain the grade-point average for admission to the program and that required by Clemson University for continuing enrollment. Grade-point ratio may be checked at the end of a semester or summer term. A student must have a cumulative grade-point ratio of 1.8 to enroll in 300-level and 2.0 to enroll in 400-level education courses. For undergraduate students who enter Clemson after May 15, 1986, a cumulative grade-point ratio of 2.0 or higher is required for registration in all teacher education courses numbered 300 or higher.

Any student who desires to enroll in education courses must meet the cumulative grade-point requirements established for Education majors.

A student who is denied admission may appeal to the College of Education Admissions Committee.

A comprehensive statement of the activities, services, and programs of the College of Education is published in the Student Handbook, which is distributed by faculty advisers to Education majors and students interested in education.

GRADUATE STUDY

The College of Education offers programs leading to the Master of Education, Master of Industrial Education, Specialist in Education, and Doctor of Education degrees.

MILITARY SCIENCE (ARMY ROTC)

The requirements for a commission in the U.S. Army are established by the U.S. law and the Department of the Army. The legal and regulatory requirements are available at the Military Science Department. In addition to the Military Science curricula, all candidates for commissioning must successfully complete 3 credit hours of military history: HIST 390 or 492. All Army scholarship cadets are required to complete one semester of a major Indo-European language or receive placement credit from the University; i.e., German, French, or Spanish, etc. Further information may be obtained from the Military Science Department.

BACHELOR OF ARTS CURRICULA

EARLY CHILDHOOD EDUCATION AND ELEMENTARY EDUCATION PROGRAMS

The Early Childhood Education curriculum prepares the student for teaching positions in kindergarten and grades one through four. The Elementary Education curriculum prepares the student for teaching on the elementary school level.

EARLY CHILDHOOD EDUCATION**FRESHMAN YEAR**

First Semester		Second Semester	
CPSC 105 Computer Applications for Ed.	1	ENGL 102 Composition II	3
ED 100 Orientation	1	HIST 172 Western Civilization	3
ENGL 101 Composition I	3	MTHSC 116 Contemporary Mathematics	
MTHSC 115 Contemporary Mathematics		for the Elementary School Teacher II	3
for the Elementary School Teacher I	3	Foreign Language ⁵	4
Foreign Language ⁵	4	Science ²	4
Science ²	4		17
	16		

SOPHOMORE YEAR

HIST 173 Western Civilization	3	ED 301 Principles of American Ed.	3
MTHSC 216 Geom. for Elem.		ED 334 Child Growth and Development	3
School Teachers	3	MUS 210 or 311 Music Appreciation	3
Foreign Language ⁵	3	Foreign Language ⁵	3
Literature Requirement ¹	3	Literature Requirement ¹	3
Science ²	4	Social Science Requirement ³	3
Social Science Requirement ³	3		18
	19		

JUNIOR YEAR

CAAH 310 Evol. of the Vis. Arts	3	ED 400 Early Childhood Field Exp. ⁷	1
ED 302 Educational Psychology	3	ED 461 Teaching Reading in the	
ED 321 Phys. Ed. for Elem. School	3	Elementary School	3
ED 336 Behavior of the Preschool Child ⁸	3	ED 483 Methods and Materials for	
ED 466 Intro. to Early Child Ed	3	Early Childhood Education	3
Elective	4	ED 488 Teaching the Language Arts	
	19	in the Elementary School	3
		ED (INED) 315 Integrating Computers into	
		the Classroom	1
		INED 372 Arts and Crafts for the	
		Elementary Child	3
		SPCH 250 Public Speaking	3
			17

SENIOR YEAR*(Block Schedule—Either Semester)*

ED 458 Health Education	3	ED 462 Diagnostic and	
ED 471 The Exceptional Child ⁶	3	Corrective Reading	3
ENGL 385 Children's Literature	3	ED 484 Directed Teaching in Early	
MUS 400 Music in the Elementary		Childhood Education ⁴	12
School Classroom	3		15
Elective	6		
	18		

139 Total Semester Hours

¹ENGL 202, 203, 204, 205, 206, 207, 208, 209²A total of 12 semester hours composed of both biological and physical sciences, including appropriate laboratories, is required. Eight of these hours must be in a two-semester sequence.³Anthropology, economics (including AGECE 202), geography, political science, psychology, sociology.⁴Block schedule must be taken as shown in either semester of the senior year⁵Two years of a foreign language are required⁶Take in second semester Sophomore year if interested in special education certification.⁷Must be taken in the same semester as ED 461. (Students taking ED 461 during the summer must register for ED 400 during the following fall semester)⁸To be taken prior to or in the same semester as ED 466**ELEMENTARY EDUCATION****FRESHMAN YEAR**

First Semester		Second Semester	
CPSC 105 Computer Applications for Ed.	1	ENGL 102 Composition II	3
ED 100 Orientation	1	HIST 172 Western Civilization	3
ENGL 101 Composition I	3	MTHSC 116 Contemporary Math.	
MTHSC 115 Contemporary Math.		for Elem. School Teachers II	3
for Elem. School Teachers I	3	Foreign Language ⁴	4
Foreign Language ⁴	4	Science ¹	4
Science ¹	4		17
	16		

SOPHOMORE YEAR

HIST 173 Western Civilization	3	ED 301 Principles of American Ed.	3
MTHSC 216 Geometry for Elem. School Teachers	3	ED 334 Child Growth and Dev.	3
Foreign Language ⁴	3	Foreign Language ⁴	3
Literature Requirement ²	3	Literature Requirement ²	3
Science ¹	4	Social Science Requirement ³	3
Social Science Requirement ³	3	Elective	3
	<u>19</u>		<u>18</u>

JUNIOR YEAR

ED 302 Educational Psychology	3	ED (INED) 315 Integrating Computers into the Classroom	1
ED 471 The Exceptional Child ⁵	3	ED 401 Elem. Field Experience ⁶	1
ED 485 Meth. and Cur. in Elem. Math. and Science	3	ED 461 Teaching Reading in the Elementary School	3
ED 488 Teaching the Language Arts in the Elementary School	3	ED 487 Teaching Social Studies in the Elementary School	2
ENGL 385 Children's Literature	3	MUS 400 Music in the Elem. School Class	3
INED 372 Arts and Crafts	3	SPCH 250 Public Speaking	3
	<u>18</u>	Elective	3
			<u>16</u>

SENIOR YEAR*(Block Schedule—Either Semester)*

CAAH 310 Evol. of the Vis. Arts	3	ED 462 Diagnostic and Corrective Reading	3
ED 321 Phys. Ed. for Elem. School	3	ED 481 Directed Teaching ⁷	12
ED 458 Health Education	3		<u>15</u>
MUS 210 or 311 Music Appreciation	3		
Elective	6		
	<u>18</u>		

137 Total Semester Hours

¹A total of 12 semester hours composed of both biological and physical sciences, including appropriate laboratories, is required. Eight of these hours must be in a two-semester sequence.

²ENGL 202, 203, 204, 205, 206, 207, 208, 209

³Anthropology, economics (including AGECE 202), geography, political science, psychology, and sociology

⁴Two years of the same foreign language are required.

⁵Take in second semester sophomore year if interested in special education certification

⁶Must be taken in the same semester as ED 461. (Students taking ED 461 during the summer must register for ED 401 during the following fall semester.)

⁷Block schedule must be taken as shown in either semester of the senior year

SECONDARY EDUCATION CURRICULA

Programs leading to a Bachelor of Arts degree in Secondary Education are available to students preparing to teach English, history, mathematical sciences, French, German, Spanish, natural sciences, political science, and social science, on the secondary school level. The teaching field should be selected as early as possible in order that appropriate freshman and sophomore courses may be taken.

Each curriculum requires a major concentration in the teaching field. Specific courses and sequences have been designated by teacher education committees to meet requirements for those planning to teach. Students who have elective courses in the teaching area should consult the departmental adviser prior to scheduling these courses.

The professional education courses should be completed in sequence prior to registering for the block schedule. Application to Directed Teaching (ED 412) should be made in writing no later than May 1 preceding the school year in which student teaching is to be scheduled. A student whose cumulative grade-point is lower than the requirement for graduation will not be permitted to register for Directed Teaching.

Education 412 is conducted on a full-day basis, "block schedule," for one semester. Students taking ED 412 will register for ED 498, this course being taught on a five-day basis during the first portion of the semester.

TEACHING AREA: ENGLISH

FRESHMAN YEAR

First Semester		Second Semester	
CPSC 105 Computer Applications for Ed.	1	ENGL 102 Composition II	3
ED 100 Orientation	1	HIST 172 Western Civilization	3
ENGL 101 Composition I	3	MTHSC 102 Intro. to Math. Analysis	3
MTHSC 101 Finite Probability	3	Foreign Language ¹	4
Foreign Language ¹	4	Science ²	4
Science ²	4	Elective	1
Elective	1		18
	17		

SOPHOMORE YEAR

ED 301 Principles of Amer. Ed.	3	ED 302 Educational Psychology	3
ENGL 202 Major Forms of Literature	3	ENGL 209 Contemporary Literature	3
HIST 173 Western Civilization	3	ENGL 353 Ethnic American Literature	3
Foreign Language ¹	3	Foreign Language ¹	3
Science ²	4	Social Science Requirement ³	3
	16	Elective	3
			18

JUNIOR YEAR

ED 335 Adol. Growth and Development	3	ED 424 Methods and Materials in Secondary English ⁵	3
ED (INED) 315 Integrating Computers into the Classroom	1	MUS 210 or 311 Music Appreciation	3
HIST 361 or 363 History of England	3	Social Science Requirement ³	3
Teaching Major ⁴	9	Teaching Major ⁴	9
Elective	2		18
	18		

SENIOR YEAR

(Block Schedule—Either Semester)

CAAH 310 Evol. of the Vis. Arts	3	ED 412 Directed Teaching	12
ED 458 Health Education	3	ED 498 Secondary Content Area Reading	3
ED 471 The Exceptional Child	3		15
Teaching Major ⁴	6		
Elective	3		
	18		

138 Total Semester Hours

¹Two years of the same language are required

²A total of 12 semester hours composed of both physical and biological sciences, including appropriate laboratories, is required. Eight of the credits must be in a two-semester sequence.

³See adviser

⁴In addition to ENGL 202, 209, and 353, the Teaching Major requires 24 semester hours of junior and senior English courses and must include ENGL 386, 400, 401, 405 or 406, 411, 422 or 423, 435 and 485.

⁵To be taken in the semester preceding student teaching

TEACHING AREA: HISTORY

FRESHMAN YEAR

First Semester		Second Semester	
ED 100 Orientation	1	CPSC 105 Computer Applications for Ed.	1
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 101 Finite Probability	3	HIST 172 Western Civilization	3
Foreign Language ¹	4	MTHSC 102 Intro. to Math. Analysis	3
Science ²	4	Foreign Language ¹	4
Elective	2	Science ²	4
	17		18

SOPHOMORE YEAR

HIST 173 Western Civilization	3	ED 301 Principles of American Ed.	3
Foreign Language ¹	3	GEOG 101 Intro. to Geography	3
Literature Requirement ³	3	HIST 101 History of the U.S.	3
Science ²	4	POSC 101 Intro. to American Politics	3
Elective	3	Foreign Language ¹	3
	<u>16</u>	Elective	3
			<u>18</u>

JUNIOR YEAR

ED 302 Educational Psychology	3	ED (INED) 315 Integrating Computers into the Classroom	1
ED 335 Adol. Growth and Development	3	ED 428 Methods and Materials in Secondary Social Sciences ⁶	3
HIST 102 History of the U.S.	3	Composition or Speech ⁴	3
Teaching Major ⁵	9	Teaching Major ⁵	9
	<u>18</u>	Elective	2
			<u>18</u>

SENIOR YEAR*(Block Schedule—Either Semester)*

CAAH 310 Evol. of the Vis. Arts	3	ED 412 Directed Teaching	12
ECON 200 Economic Concepts	3	ED 471 The Exceptional Child	3
ED 458 Health Education	3	ED 498 Secondary Content Area Reading	3
MUS 210 or 311 Music Appreciation	3		<u>18</u>
Teaching Major ⁵	6		
	<u>18</u>		

141 Total Semester Hours

¹Two years of the same language are required²A total of 12 credits composed of both physical and biological sciences, including appropriate laboratories, is required. Eight of the credits must be in a two-semester sequence.³ENGL 202, 203, 204, 205, 206, 207, 208, 209.⁴ENGL 231, 312, 314, SPCH 250⁵The Teaching Major requires HIST 313 and 21 hours of junior and senior level (300 and 400) courses, 6 hours at the 400 level. Courses must be selected with the consent of the major adviser and include at least 3 hours in each of the following categories: U.S. History, European History, Third World or non-European History.⁶To be taken in the semester preceding Directed Teaching.

Note: This program enables the student to meet the requirements for certification in South Carolina in the field of history. If certification in social sciences is desired, the student must select one three-hour course in geography or political science.

TEACHING AREA: MATHEMATICS**FRESHMAN YEAR****First Semester**

BIOL 103 General Biology I	3
BIOL 105 General Biology Lab. I	1
CPSC 105 Computer Applications for Ed.	1
ED 100 Orientation	1
ENGL 101 Composition I	3
MTHSC 106 Cal. of One Var. I	4
Foreign Language ¹	4
	<u>17</u>

Second Semester

BIOL 104 General Biology II	3
BIOL 106 General Biology Lab. II	1
ENGL 102 Composition II	3
MTHSC 108 Cal. of One Var. II	4
Foreign Language ¹	4
Elective	3
	<u>18</u>

SOPHOMORE YEAR

ED 302 Educational Psychology	3	CPSC 110 Elem. Comp. Prog.	3
MTHSC 206 Calculus of Sev. Var	4	ED 335 Adol. Growth and Dev.	3
Foreign Language ¹	3	HIST 173 Western Civilization	3
Literature Requirement ²	3	Foreign Language ¹	3
Science Requirement ³	3	Science Requirement ³	3
Elective	1	Social Science Requirement ⁵	3
	<u>17</u>		<u>18</u>

JUNIOR YEAR

ED 301 Principles of American Ed.	3	CAAH 310 Evol. of the Vis. Arts	3
ED (INED) 315 Integrating Computers into the Classroom	1	ED 426 Methods and Materials in Secondary Mathematics ⁶	3
HIST 172 Western Civilization	3	MTHSC 311 Linear Algebra	3
MTHSC 301 Stat. Theory and Meth. I	3	MTHSC 408 Topics in Geometry	3
MTHSC 308 College Geometry	3	Composition and Speech ⁴	3
Social Science Requirement ⁵	3	Elective	3
Elective	3		<u>18</u>
	<u>19</u>		

SENIOR YEAR*(Block Schedule—Either Semester)*

ED 458 Health Education	3	ED 412 Directed Teaching	12
ED 471 The Exceptional Child	3	ED 498 Secondary Content	
MTMSC 412 Intro. to Mod. Algebra	3	Area Reading	3
MTMSC 453 Advanced Calculus I	3		15
MUS 210 or 311 Music Appreciation	3		
Mathematics Requirement ⁷	3		
	18		

140 Total Semester Hours

¹Two years of the same language are required.²ENGL 202, 203, 204, 205, 206, 207, 208, 209.³Astronomy, chemistry, geology, physics.⁴ENGL 231, 312, 314, SPCH 250.⁵Economics (including AGEC 202), geography, political science, psychology, sociology.⁶To be taken in the semester preceding Directed Teaching.⁷Any 200-400 level mathematics course, except MTHSC 207, 210, 215, 216.**TEACHING AREA: MODERN LANGUAGES
(French, German, and Spanish)****FRESHMAN YEAR****First Semester**

CPCSC 105 Computer Applications for Ed.	1
ED 100 Orientation	1
ENGL 101 English Composition I	3
MTMSC 101 Finite Probability	3
Foreign Language ¹	4
Science ²	4
	16

Second Semester

ENGL 102 English Composition II	3
HIST 172 Western Civilization	3
MTMSC 102 Intro. to Math. Analysis	3
Foreign Language ¹	4
Science ²	4
	17

SOPHOMORE YEAR

ED 301 Prin. of American Education	3
HIST 173 Western Civilization	3
Foreign Language ¹	3
Literature Requirement ³	3
Science ²	4
	16

ED 302 Educational Psychology	3
Foreign Language ¹	3
Literature Requirement ³	3
Social Science Requirement ⁵	3
Elective	6
	18

JUNIOR YEAR

ED 335 Adol. Growth and Develop.	3
Teaching Major ⁷	9
Social Science Requirement ⁵	3
Elective	3
	18

ED (INED) 315 Integrating Computers into the Classroom	1
ED 425 Methods and Materials in Secondary Language ⁶	3
ED 471 The Exceptional Child	3
Composition and Speech ⁴	3
Teaching Major ⁷	9
	19

SENIOR YEAR*(Block Schedule—Either Semester)*

CAAH 310 Evol. of the Vis. Arts	3
ED 458 Health Education	3
MUS 210 or 311 Music Appreciation	3
Teaching Major ⁷	6
Elective	3
	18

ED 412 Directed Teaching	12
ED 498 Secondary Content	
Area Reading	3
	15

137 Total Semester Hours

¹Two years of the same language are required.²A total of 12 semester hours, composed of both physical and biological sciences, including appropriate laboratories, is required. Eight of the credits must be in a two-semester sequence.³ENGL 202, 203, 204, 205, 206, 207, 208, 209.⁴ENGL 231, 312, 314, SPCH 250.⁵Economics (including AGEC 202), political science, psychology, sociology, geography, anthropology.⁶To be taken in the semester preceding Directed Teaching.⁷The teaching Major requires 24 semester hours in either French, German, or Spanish as listed.

French Major Must include FR 205, 409, and 18 hours arranged as follows:

Group I: 12 hours from FR 209, 301 or 302, 305, 307

Group II: 6 hours at the 400 level, including at least one 400-level literature course

German Major Must include GER 305, 411, and 18 semester hours arranged as follows:

Group I: 12 hours from GER 301, 302, 307, 316, 412 or 416.

Group II: 6 hours from GER 401, 402, 403 or 413.

Spanish Major Must include SPAN 205 and 21 semester hours arranged as follows:

Group I: 6 hours from SPAN 303 or 304 and 311 (preferably in sequence).

Group II: 9 hours from SPAN 305, 307, 308.

Group III: 6 hours from SPAN 401 or 402 and 409

TEACHING AREA: POLITICAL SCIENCE

FRESHMAN YEAR

First Semester		Second Semester	
ED 100 Orientation	1	CPSC 105 Computer Applications for Ed.	1
ENGL 101 English Composition I	3	ENGL 102 English Composition II	3
HIST 172 Western Civilization	3	HIST 173 Western Civilization	3
MTHSC 101 Finite Probability	3	MTHSC 102 Intro. to Math. Analysis	3
Foreign Language ¹	4	Foreign Language ¹	4
Science ²	4	Science ²	4
	<u>18</u>		<u>18</u>

SOPHOMORE YEAR

HIST 101 History of the U.S.	3	ED 301 Principles of American Ed	3
POSC 101 Intro. to American Politics	3	HIST 102 History of the U.S.	3
Foreign Language ¹	3	POSC 201 Intro. to Gov't and Politics	3
Literature Requirement ³	3	Foreign Language ¹	3
Science ²	4	Elective	6
	<u>16</u>		<u>18</u>

JUNIOR YEAR

ED 302 Educational Psychology	3	ED 428 Methods and Materials in Secondary Social Science ⁶	3
ED (INED) 315 Integrating Computers into the Classroom	1	Composition or Speech ⁴	3
ED 335 Adol. Growth and Development	3	Teaching Major ⁵	9
Teaching Major ⁵	9	Elective	3
Elective	1		<u>18</u>
	<u>17</u>		

SENIOR YEAR

(Block Schedule—Either Semester)

CAAH 310 Evol. of the Vis. Arts	3	ED 412 Directed Teaching	12
ECON 200 Economic Concepts	3	ED 471 The Exceptional Child	3
ED 458 Health Education	3	ED 498 Secondary Content Area Reading	3
MUS 210 or 311 Music Appreciation	3		<u>18</u>
Teaching Major ⁵	6		
	<u>18</u>		

141 Total Semester Hours

¹Two years of the same language are required.

²A total of 12 semester hours composed of both physical and biological science including appropriate laboratories, is required. Eight of the semester hours must be in a two-semester sequence.

³ENGL 202, 203, 204, 205, 206, 207, 208, 209.

⁴ENGL 231, 312, 314, SPCH 250.

⁵The teaching Major requires POSC 302 and 21 credits of junior- and senior-level political science courses. The credits are to be drawn from three of the following fields.

American Governments—POSC 403, 405, 432, 442

Comparative Governments—POSC 371, 373, 471, 475, 476

International Relations—POSC 361, 428, 462, 463, 465

Political Theory—POSC 351, 352, 453

Public Policy and Administration—POSC 302, 321, 422

⁶To be taken in the semester preceding Directed Teaching

Note: This program enables the student to meet the requirements for certification in South Carolina in the field of political science. If certification in social studies is desired, the student must take a three-hour course in either geography or sociology

TEACHING AREA: SOCIAL SCIENCES**FRESHMAN YEAR****First Semester**

ED 100 Orientation	1
ENGL 101 Composition I	3
HIST 172 Western Civilization	3
MTHSC 101 Finite Probability	3
Foreign Language ¹	4
Science Requirement ²	4
	18

Second Semester

CPSC 105 Computer Applications for Ed.	1
ENGL 102 Composition II	3
HIST 173 Western Civilization	3
MTHSC 102 Intro. to Math. Analysis	3
Foreign Language ¹	4
Science Requirement ²	4
	18

SOPHOMORE YEAR

HIST 101 History of the U.S.	3
PSYCH 201 Intro. to Psychology	3
Foreign Language ¹	3
Literature Requirement ³	3
Science Requirement ²	4
Elective	2
	18

GEOG 101 Intro. to Geography	3
HIST 102 History of the U.S.	3
POSC 101 Intro. to American Politics	3
SOC 201 Introduction to Sociology	3
Composition or Speech ⁴	3
Foreign Language ¹	3
	18

JUNIOR YEAR

ED 301 Principles of American Ed.	3
ED 302 Educational Psychology	3
ED 335 Adol. Growth and Development	3
Teaching Major ⁵	9
	18

ED (INED) 315 Integrating Computers into the Classroom	1
ED 428 Methods and Materials in Secondary Social Sciences ⁶	3
Teaching Major ⁵	9
Elective	5
	18

SENIOR YEAR*(Block Schedule—Either Semester)*

CAAH 310 Evol of the Vis. Arts	3
ED 458 Health Education	3
MUS 210 or 311 Music Appreciation	3
Teaching Major ⁵	6
Elective	3
	18

ED 412 Directed Teaching	12
ED 471 The Exceptional Child	3
ED 498 Secondary Content Area Reading	3
	18

144 Total Semester Hours

¹Two years of the same language are required.²A total of 12 semester hours composed of both physical and biological sciences, including appropriate laboratories, is required. Eight of the semester hours must be in a two-semester sequence³ENGL 202, 203, 204, 205, 206, 207, 208, and 209⁴ENGL 231, 312, 314, SPCH 250⁵The Teaching Major consists of ECON 211/212 and 18 semester hours of junior and senior (300 and 400) level courses selected from sociology and psychology with no fewer than 6 hours in each. Recommended courses include the following: PSYCH 320, 330, 333, 340, 352, 370, 415; SOC 311, 392, 395, 460, 461, 481.⁶To be taken in the semester preceding Directed Teaching**BACHELOR OF SCIENCE CURRICULA****AGRICULTURAL EDUCATION**

The College of Education and the College of Agricultural Sciences conduct a cooperative program to produce agricultural teachers for South Carolina. (See the Agricultural Education curriculum under the College of Agricultural Sciences.)

GRAPHIC COMMUNICATIONS

The Bachelor of Science degree in Graphic Communications is designed to prepare students for professional careers in printing, publishing, packaging, and related industries. The core curriculum assures the graduate of having the skills and knowledge required by most entry-level jobs. The approved electives provide each student the opportunity to select

courses which enhance career preparation in specific segments of graphic communications. The nature of the coursework is heavily oriented around individual laboratory performance which stresses the development of problem solving skills in a broad cross section of manufacturing areas. Applications include all major processes and a variety of industry segments, including commercial printing, publishing, package production, specialty printing, and industrial applications of printing technology beyond communications. The most common career opportunities are in printing management, production planning and supervision, and both commercial and technical sales.

FRESHMAN YEAR

First Semester		Second Semester	
ENGL 101 Composition I	3	CPSC 110 Elem. Comp. Programming	3
GC 101 Orientation to Graphic Comm.	1	or CPSC 120 Intro. to Information Processing Systems	3
INED 106 Drafting for Industrial Ed. I	3	ECON 200 Economic Concepts	3
Approved Lab. Science Requirement ²	4	or ECON 211 Prin. of Economics	3
Mathematics Requirement ¹	3	ENGL 102 English Composition II	3
Elective	3	GC 104 Graphic Arts I	3
	17	Mathematics Requirement ¹	3
		Elective	2
			17

SOPHOMORE YEAR

ACCT 203 Financial Accounting ⁵	3	ACCT 307 Managerial Accounting	3
GC 207 Graphic Arts II	3	GC 304 Photographic Techniques	3
INED 105 Machining Practice	3	MGT 399 Mgt. Application of Microcomputers	2
MGT 299 Computer Utilization I	1	PSYCH 201 Introduction to Psychology	3
MGT 301 Principles of Management	3	Laboratory Science Requirement ²	4
Approved Lab. Science Requirement ²	4	Elective	1
	17		16

GC 350 Internship I⁴ 1

JUNIOR YEAR

GC 440 Adv. Lithographic Methods	4	GC 406 Prob. in Specialty Printing	4
INED 208 Electricity	3	MGT 307 Personnel Management	3
INED 325 Ind. Organizations and People	3	MKT 301 Principles of Marketing	3
PSYCH 364 Industrial Psychology	3	SPCH 250 Public Speaking	3
Literature Requirement ³	3	Humanities Requirement	3
	16		16

GC 450 Internship II⁴ 1

SENIOR YEAR

ENGL 314 Technical Writing	3	GC 448 Planning and Controlling Printing Functions	3
GC 444 Current Developments and Trends in Graphic Communications	3	INED 496 Public Relations	3
Approved Elective ¹	8	Approved Elective ¹	8
Elective	3	Elective	3
	17		17

135 Total Semester Hours

¹Approved Electives and Mathematics Requirements must be approved by adviser

²Approved Laboratory Science Requirement must include a two-semester sequence from chemistry or physics

³ENGL 202, 203, 204, 205, 206, 207, 208, 209

⁴Student is required to complete at least two work periods of twelve or more weeks full time; one must be during a regular semester. It is recommended that the student work in as many places and time periods as possible

⁵ACCT 201 and 202 may be taken in lieu of ACCT 203

INDUSTRIAL EDUCATION

The Bachelor of Science degree in Industrial Education is designed to prepare students for professional teaching positions, as well as occupations within the framework of human resource development/industrial training in the private sector. To accomplish these purposes the curriculum is divided into the three areas of specialization. By the end of the freshman year, each student is required to select one of three options: Education for Industry, Industrial Technology Education, or Vocational-Technical Education. Each option requires 135 semester hours of coursework.

EDUCATION FOR INDUSTRY OPTION

The Education for Industry Option is designed to prepare students to enter industry or business as training and development specialists. The curriculum provides participants with a broad exposure to industrial processes in the areas of manufacturing, construction, transportation, and communications. Numerous hands-on experiences related to the application of technology in industry are integrated with valuable skills and knowledge from the training and development profession. Students will exit the program with skills related to analyzing needs; conducting job and task analyses; designing, marketing, and evaluating training programs; delivering professional presentations; and developing instructional materials.

FRESHMAN YEAR

First Semester		Second Semester	
ENGL 101 Composition I	3	ENGL 102 Composition II	3
INED 101 Intro. to Industrial Ed.	3	GC 104 Graphic Arts I	3
INED 102 Woodworking I	2	INED 108 Training Prog. in Industry I	3
INED 105 Machining Practices	3	Mathematics Requirement	3
INED 106 Drafting for Industrial Ed. I	3	Science Requirement ¹	4
Mathematics Requirement	3	Elective	1
	<u>17</u>		<u>17</u>

SOPHOMORE YEAR

INED 203 Basic Metal Processes	3	ACCT 203 Financial Accounting	3
INED 205 Power Technology	3	ECON 200 Economic Concepts	3
SOC 201 Introduction to Sociology	3	INED 208 Electricity	3
Literature Requirement ²	3	PSYCH 201 Introduction to Psychology	3
Science Requirement ¹	4	Humanities Requirement	3
Elective	1	Elective	2
	<u>17</u>		<u>17</u>

JUNIOR YEAR

ECON 301 Economics of Labor	3	ENGL 314 Technical Writing	3
INED 325 Ind. Organizations and People	3	INED 316 Plastics and Plastic Proc.	3
MGT 301 Principles of Management	3	MGT 307 Personnel Management	3
SPCH 250 Public Speaking	3	PSYCH 364 Industrial Psychology	3
Computer Applications ³	3	Approved Elective ⁴	3
Approved Elective ⁴	1	Elective	2
	<u>16</u>		<u>17</u>

SENIOR YEAR

INED 404 Org. of Ind. Training Mat.	3	INED 408 Training Prog. in Ind. II	3
INED 418 Tech. Concepts in Mfg.	3	INED 415 Construction Practices	3
TEXT 460 Textile Processes	3	INED 465 Instructional Video Production	3
Approved Elective ⁴	6	INED 496 Public Relations	3
Elective	2	Approved Elective ⁴	3
	<u>17</u>	Elective	<u>2</u>
			17

135 Total Semester Hours

¹An 8-credit sequence of biological or physical science, each including laboratories.

²ENGL 202, 203, 204, 205, 206, 207, 208, 209.

³CPSC 110, 120, 150, 152, 156, INED 480.

⁴Approved electives to be approved by adviser; two technical courses must be represented.

Note: One summer (400 clockhours) of field experience is required of each student following the sophomore year.

INDUSTRIAL TECHNOLOGY EDUCATION OPTION

The Industrial Technology Education option is for students who desire to teach industrial technology in the secondary schools. Industrial technology is the subject area in the public school system which attempts to provide youth with an interpretation of American industry. It is a general education subject designed to give students exploratory experience in the classroom and laboratory. Majors in this option are qualified to seek certification as secondary school teachers of industrial technology, prevocational, and industrial arts education.

FRESHMAN YEAR

First Semester		Second Semester	
ED 100 Orientation	1	ENGL 102 Composition II	3
ENGL 101 Composition I	3	INED 102 Woodworking II	2
INED 101 Intro. to Industrial Ed.	3	INED 105 Machining Practices	3
INED 106 Drafting for Ind. Ed. I	3	INED 107 Drafting for Ind. Ed. II	3
Mathematics Requirement	3	Mathematics Requirement	3
Science Requirement ¹	4	Science Requirement ¹	4
	<u>17</u>		<u>18</u>

SOPHOMORE YEAR

GC 104 Graphic Arts I	3	INED 103 Woodworking II	2
HIST 191 The World in the 20th Century	3	INED 205 Power Technology	3
INED 203 Basic Metal Processes	3	INED 208 Electricity	3
Literature Requirement ²	3	MUS 210 or 311 Music Appreciation	3
Science Requirement ¹	4	Social Science Requirement ³	3
Elective	3	Elective	2
	<u>19</u>		<u>16</u>

JUNIOR YEAR

CAAH 310 Evol. of the Vis. Arts	3	ED 335 Adol. Growth and Development	3
ED 302 Educational Psychology	3	INED 317 Management of Ind. Ed. Labs	3
ED 458 Health Education	3	INED 414 Electronics for Teachers	3
INED 415 Construction Practices	3	INED 418 Tech. Concepts in Manufacturing	3
SPCH 250 Public Speaking	3	Social Science Requirement ³	3
Elective	1	Technical Specialty ⁴	3
	<u>16</u>		<u>18</u>

SENIOR YEAR

INED 405 Course Org. and Eval	3	INED 402 Directed Teaching	12
INED 425 Teaching Industrial Subjects	3	INED 422 Hist. and Phil. of Ind. and Voc. Ed.	3
INED 443 Voc. Spec. Needs Education	3		<u>3</u>
INED 480 Ed. App. of Microcomputers	3		15
Elective	4		
	<u>16</u>		

135 Total Semester Hours

¹Both biological and physical laboratory sciences must be represented with an 8-credit sequence in one.

²ENGL 202, 203, 204, 205, 206, 207, 208, 209.

³Economics (including AGECE 202), geography, history, psychology, sociology.

⁴CC 207, 304, INED 206, 215, 316, 320, 407, 432, 435, 438, 464, 465, 468, 470, 482, TEXT 460.

VOCATIONAL-TECHNICAL EDUCATION OPTION

The Vocational-Technical Education option is designed to prepare teachers of vocational and technical subjects in the senior high schools, area vocational centers, and technical education centers. All elective courses in this option will be in an area of specialization or related fields. Teachers graduating from this option will possess the skills and knowledge required to teach the occupation or family of occupations in their area of specialization.

FRESHMAN YEAR

First Semester		Second Semester	
ENGL 101 Composition I	3	ENGL 102 Composition II	3
Mathematics Requirement	3	Mathematics Requirement	3
Science Requirement ¹	4	Science Requirement ¹	4
Technical Specialty Requirement ²	3	Technical Specialty Requirement ²	3
Elective	3	Elective	3
	<u>16</u>		<u>16</u>

SOPHOMORE YEAR

Literature Requirement ³	3	Humanities Requirement ¹	3
Social Science Requirement ¹	3	Science Requirement ¹	3
Technical Specialty Requirement ²	6	Social Science Requirement ¹	3
Elective	4	Technical Specialty Requirement ²	6
	<u>16</u>		<u>15</u>

SUMMER

INED 350 Industrial Cooperative Experience I	6
--	---

JUNIOR YEAR

INED 312 Motivation and Discipline in Vocational Education	3	INED 317 Mgt. of Ind. Ed. Laboratories	3
SPCH 250 Public Speaking	3	Technical Specialty Requirement ²	6
Technical Specialty Requirement ²	6	Approved Elective ⁴	3
Approved Elective ⁴	3	Elective	3
	<u>15</u>		<u>15</u>

SUMMER

INED 450 Industrial Cooperative Experience II	6
---	---

SENIOR YEAR

INED 405 Course Organization and Evaluation	3	INED 422 Hist. and Phil. of Industrial and Vocational Education	3
INED 420 Instructional Technology	3	INED 434 Internship in Voc. Tech. Ed. II	6
INED 425 Teaching Ind. Subjects	3	INED 442 Competency Testing in Voc. Subj.	3
INED 433 Internship in Voc. Tech. Ed. I	6	INED 480 Ed. Appl. of Microcomputers	3
	<u>15</u>		<u>15</u>

135 Total Semester Hours

¹See General Education Requirements.

²Technical specialties must relate to one of the Trades and Industries programs recognized by the South Carolina Department of Education. See adviser for list of approved specialties and list of courses available to meet the Technical Specialty Requirement.

³ENGL 202, 203, 204, 205, 206, 207, 208, 209.

⁴Approved electives must be approved by adviser.

SCIENCE TEACHING

The program leading to a Bachelor of Science degree in Science Teaching is designed for students planning to teach biological sciences,

chemistry, earth science, mathematical sciences, or physical sciences on the secondary school level. The required science electives are included to give some degree of competency in a field other than the major area. Students are urged to discuss the National Teacher's Examination with their adviser upon completion of the sophomore year.

TEACHING AREA: BIOLOGICAL SCIENCES

FRESHMAN YEAR

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 112 General Chemistry	4
CPSC 105 Computer Applications for Ed	1	ENGL 102 Composition II	3
ED 100 Orientation	1	HIST 172 Western Civilization	3
ENGL 101 Composition I	3	MTHSC 301 Stat. Theory and Meth. I	3
MTHSC 106 Cal. of One Var. I	4	MUS 210 or 311 Music Appreciation	3
Elective	3		16
	16		

SOPHOMORE YEAR

BIOL 110 Principles of Biology I	5	BIOCH 210 Elementary Biochemistry	4
ED 302 Educational Psychology	3	BIOL 111 Principles of Biology II	5
HIST 173 Western Civilization	3	ED 335 Adol. Growth and Devopment	3
Literature Requirement ¹	3	Social Science Requirement ²	3
Chemistry Elective	4	Elective	3
	18		18

JUNIOR YEAR

ED 301 Principles of American Ed.	3	BIOSC 201 Plant Diversity	4
ED (INED) 315 Integrating Computers into the Classroom	1	BIOSC 202 Animal Diversity	4
GEN 302 Introductory Genetics	4	ED 427 Meth. and Mat.in Sec. Sciences ⁴	3
MICRO 305 General Microbiology	4	PHYS 208 General Physics II	4
PHYS 207 General Physics	4	Elective	4
Composition or Speech ³	3		19
	19		

SENIOR YEAR

(Block Schedule—Either Semester)

BOT 421 Plant Physiology	4	ED 412 Directed Teaching	12
or ZOOL 223 Human Physiology	4	ED 498 Secondary Content Area Reading	3
CAAH 310 Evol. the of Vis. Arts	3		15
ED 458 Health Education	3		
ED 471 The Exceptional Child	3		
Social Science Requirement ²	3		
	16		

137 Total Semester Hours

¹ENGL 202, 203, 204, 205, 206, 207, 208, 209.

²Anthropology, economics (including AGECE 202), geography, political science, psychology, sociology.

³ENGL 231, 312, 314, SPCH 250.

⁴To be taken during the semester preceding student teaching

TEACHING AREA: EARTH SCIENCE

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	3	BIOL 104 General Biology II	3
BIOL 105 General Biology Lab. I	1	BIOL 106 General Biology Lab. II	1
CH 101 General Chemistry	4	CH 102 General Chemistry	4
CPSC 105 Computer Applications for Ed.	1	ED 100 Orientation	1
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I	4	MTHSC 301 Stat. Theory and Methods I	3
	16	Elective	2
			17

SOPHOMORE YEAR

ED 301 Principles of American Ed.	3	ED 302 Educational Psychology	3
GEOL 101 Physical Geology	3	GEOL 102 Historical Geology	3
GEOL 103 Physical Geology Lab	1	GEOL 104 Historical Geology Lab	1
HIST 172 Western Civilization	3	HIST 173 Western Civilization	3
PHYS 207 General Physics I	4	PHYS 208 General Physics II	4
Literature Requirement ¹	3	SPCH 250 Public Speaking	3
	<u>17</u>		<u>17</u>

JUNIOR YEAR

ASTR 101 Solar System Astronomy	3	ED 458 Health Education	3
ASTR 103 Solar System Astronomy Lab	1	PHYS 240 Physics of the Weather	3
ED (INED) 315 Integrating Computers into the Classroom	1	Geology Elective ³	3-4
ED 335 Adolescent Growth and Development	3	Elective	4
GEOL 306 Mineralogy	3	Social Science Requirement ²	3
MUS 210 or 311 Music Appreciation	3		<u>16-17</u>
Social Science Requirement ²	3		
	<u>17</u>		

SENIOR YEAR*(Block Schedule—Either Semester)*

ASTR 102 Stellar Astronomy	3	ED 412 Directed Teaching	12
ASTR 104 Stellar Astronomy Lab	1	ED 498 Secondary Content Area Reading	3
CAAH 310 Evol. of the Vis. Arts	3		<u>15</u>
ED 427 Methods and Mat. in Sec. Science	3		
ED 471 The Exceptional Child	3		
Elective	4		
	<u>17</u>		

132-133 Total Semester Hours

¹ENGL 202, 203, 204, 205, 206, 207, 208, 209²Anthropology, economics (including AGECE 202), geography, political science, psychology, sociology.³GEOL 309, 403, 405**TEACHING AREA: MATHEMATICS****FRESHMAN YEAR****First Semester**

BIOL 103 General Biology I	3
BIOL 105 General Biology Lab. I	1
CH 101 General Chemistry	4
CPSC 105 Computer Applications for Ed.	1
ED 100 Orientation	1
ENGL 101 Composition I	3
MTHSC 106 Cal. of One Var. I	4
	<u>17</u>

Second Semester

BIOL 104 General Biology II	3
BIOL 106 General Biology Lab. II	1
CH 102 or 112 General Chemistry	4
ENGL 102 Composition II	3
MTHSC 108 Cal. of One Var. II	4
Elective	3
	<u>18</u>

SOPHOMORE YEAR

ED 302 Educational Psychology	3	CPSC 110 Elem. Comp. Prog.	3
HIST 172 Western Civilization	3	ED 335 Adol. Growth and Development	3
MTHSC 206 Calculus of Sev. Var.	4	HIST 173 Western Civilization	3
PHYS 207 General Physics I	4	PHYS 208 General Physics II	4
Literature Requirement ¹	3	MUS 210 or 311 Music Appreciation	3
	<u>17</u>	Elective	2
			<u>18</u>

JUNIOR YEAR

ED 301 Principles of American Ed.	3	ED (INED) 315 Integrating Computers into the Classroom	1
MTHSC 301 Stat. Theory and Meth. I	3	ED 426 Methods and Materials in Secondary Mathematics ⁵	3
MTHSC 308 College Geometry	3	MTHSC 311 Linear Algebra	3
Mathematics Requirement ³	3	MTHSC 408 Topics in Geometry	3
Social Science Requirement ⁴	3	Composition or Speech ²	3
Elective	3	Social Science Requirement ⁴	3
	<u>18</u>	Elective	2
			<u>18</u>

SENIOR YEAR

(Block Schedule—Either Semester)

CAAH 310 Evol. of the Vis. Arts	3	ED 412 Directed Teaching	12
ED 458 Health Education	3	ED 498 Secondary Content Area	
ED 471 The Exceptional Child	3	Reading	3
MTHSC 412 Intro. to Modern Alg.	3		15
MTHSC 453 Advanced Calculus I	3		
Mathematics Requirement ³	3		
	18		

139 Total Semester Hours

¹ENGL 202, 203, 204, 205, 206, 207, 208, 209.

²ENGL 231, 312, 314, SPCH 250.

³Any 200-400 level mathematics course, except MTHSC 207, 210, 215, 216.

⁴Economics (including AGECE 202), geography, political science, psychology, sociology.

⁵To be taken in the semester preceding Directed Teaching

TEACHING AREA: PHYSICAL SCIENCES

FRESHMAN YEAR

First Semester

CH 101 General Chemistry	4
CPSC 105 Computer Applications for Ed.	1
ENGL 101 Composition I	3
HIST 172 Western Civilization	3
MTHSC 106 Calculus of One Var. I	4
Elective	1
	16

Second Semester

CH 112 General Chemistry	4
CH 205 Intro. to Inorganic Chemistry	2
ED 100 Orientation	1
ENGL 102 Composition II	3
HIST 173 Western Civilization	3
MTHSC 108 Calculus of One Var. II	4
	17

SOPHOMORE YEAR

BIOL 103 General Biology I	3
BIOL 105 General Biology Lab	1
CH 201 Survey of Organic Chemistry	4
ED 301 Prin. of American Education	3
MTHSC 301 Stat. Theory and Methods I	3
MUS 210 or 311 Music Appreciation	3
PHYS 101 Current Topics in Modern Phys.	1
	18

BIOL 104 General Biology II	3
BIOL 106 General Biology Lab	1
ED 302 Educational Psychology	3
PHYS 122 Physics with Calculus I	3
PHYS 124 Physics Lab. I	1
Literature Requirement ¹	3
Elective	3
	17

JUNIOR YEAR

ASTR 101 Solar System Astronomy	3
ASTR 103 Solar System Astronomy Lab	1
ED 458 Health Education	3
PHYS 221 Physics with Calculus II	3
PHYS 223 Physics Lab. II	1
Social Science Requirement ²	3
Elective	3
	17

ED (INED) 315 Integrating Computer into the Classroom	1
ED 335 Adolescent Growth and Dev.	3
PHYS 222 Physics with Calculus III	3
PHYS 224 Physics Lab. III	1
PHYS 240 Physics of the Weather	3
SPCH 250 Public Speaking	3
Elective	3
	17

SENIOR YEAR

(Block Schedule—Either Semester)

CAAH 310 Evol. of the Vis. Arts	3	ED 412 Directed Teaching	12
CH 313 Quantitative Analysis	3	ED 498 Secondary Content Area	
CH 317 Quantitative Analysis Lab	1	Reading	3
ED 471 The Exceptional Child	3		15
ED 427 Methods and Mat. in Sec. Science ³	3		
Social Science Requirement ²	3		
	16		

133 Total Semester Hours

¹ENGL 202, 203, 204, 205, 206, 207, 208, 209.

²Anthropology, economics (including AGECE 202), geography, political science, psychology, sociology

³To be taken during the semester preceding Directed Teaching

COLLEGE OF ENGINEERING

The College of Engineering offers eight professional Bachelor of Science degree programs: Agricultural Engineering, Ceramic Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, Industrial Engineering, and Mechanical Engineering; and a Bachelor of Science degree program in Engineering Analysis. Each of the engineering programs offered leads to a wide range of career opportunities and serves as preparation for further study at the graduate level.

PROFESSIONAL CURRICULA

Each of the eight professional curricula is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, the recognized national accrediting agency for professional curricula in engineering. The curriculum in Agricultural Engineering is jointly administered by the College of Agricultural Sciences and the College of Engineering.

Although the College of Engineering does not offer specific options or majors in each of these professional curricula, the instruction includes many phases of each respective field. Thus, a civil engineering student is graduated in civil engineering rather than in structural engineering, highway engineering, sanitary engineering, or other such options. However, a student who wishes to study within the areas encompassed by these options will find adequate courses within the Civil Engineering curriculum to prepare for work in any of these areas. In the same way, the other engineering curricula include thorough education in various phases of the field of specialization without overemphasizing one phase to the neglect of others. The professional curricula lead to a Bachelor of Science degree in the specific professional area.

MINORS

In addition to the major, University policy now allows students in the Bachelor of Science degree programs to have a designated minor. The minor area designation and supporting courses will appear on the student's transcript and other official University records. The University department offering a minor will list the requirements in the appropriate section of the catalog. By careful selection of electives, engineering students often may complete a minor course of study within the semester hour requirement of the major. Students should consult with their advisers for additional details.

POLICY ON TRANSFER FROM THE FRESHMAN ENGINEERING PROGRAM TO A PROFESSIONAL PROGRAM IN THE COLLEGE OF ENGINEERING

To transfer from the freshman engineering program to one of the eight professional-oriented curricula, or to Engineering Analysis, a student must complete the freshman curriculum and achieve an overall 2.0 grade-point ratio. The transfer request must be initiated by the student during the semester in which he/she expects to complete the freshman curriculum and prior to preregistration. Students who fail to meet requirements for transfer to a professional curriculum may remain in the freshman engineering program to establish transfer eligibility, but cannot enroll in engineering courses other than CRE 310, EG 208, 209, EM

201, 202, ENGR 180. A student transferring to an engineering degree program will follow the curriculum that is in place at the time of transfer.

POLICY ON HUMANITIES AND SOCIAL SCIENCES FOR ENGINEERING CURRICULA

To ensure that young engineers are aware of their responsibilities to society and are able to consider societal factors in the decision-making process, courses in the humanities and social sciences must be an integral part of their education. While there are many humanistic/social science courses that may be of interest and value to the engineering student, the objectives of the profession require the concentration of some courses in one or two areas rather than a selection of totally unrelated, introductory courses in different areas.

To meet these professional objectives, a student must have accumulated a minimum of 16 credit hours in the humanities and social sciences. These credits must satisfy the following criteria:

1. Either
 - a) Nine credit hours in a given subject area
or
 - b) Six credit hours in each of two different subject areas.
2. A minimum of 6 credit hours in humanities, which must include the following:
 - a) Three credit hours selected from sophomore literature courses (200 level) or foreign language literature (300 level or higher).
 - b) Three credit hours selected from the following (excluding skills courses): art and architectural history, drama, foreign language literature (300 level or higher), humanities, music, philosophy, religion, or sophomore literature courses (200 level), and visual arts.
3. A minimum of 6 credit hours in social sciences, selected from anthropology, economics, geography, history, political science, psychology, and sociology (including crosslisted rural sociology courses).

Additional requirements (e.g., an economics or second literature course) may be specified by individual departments. Students should consult with their academic advisers for details.

The courses which can be taken to satisfy requirements 1, 2, and 3 above must be selected from the approved list available from the departmental adviser.

POLICY ON ELECTIVES FOR THE ENGINEERING CURRICULA

Class advisers must approve any course taken for elective credit in the Engineering curricula. Courses excluded for elective credit in the Engineering curricula are as follows: ENGL 100, MTHSC 101, 102, 105, 115, 116, 215, 216, PHYS 207, 208, 460.

COURSE PREREQUISITE

A cumulative grade-point ratio of 2.0 or higher is required for registration in all engineering courses numbered 300 or higher. For students who entered before May 15, 1983, a grade-point ratio of 1.8 or higher is required for registration in all engineering courses numbered 300 or higher.

REQUIREMENTS FOR GRADUATION

In addition to other institutional requirements, and effective with all students entering after May 15, 1981, the following will apply to all candidates for a baccalaureate degree in Engineering.

For graduation, candidates will be required to have a 2.0 or higher cumulative grade-point ratio in all engineering courses taken at Clemson University. All of these courses exclusively utilize the word "Engineering" in the course designator (i.e., AGE 221, ME 499, etc.).

The courses required of all freshman engineering students follow.

FRESHMAN YEAR PROGRAM

All first-year engineering students are admitted by the University into the Freshman Engineering Program rather than specific professional engineering curricula. Students in the Freshman Engineering Program pursue a common curriculum which forms the first year for all nine engineering degree-granting curricula available at Clemson.

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 102 or 112 General Chemistry ³	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
ENGR 180 Computers in Engineering ¹	3	ENGR 101 Introduction to Engineering ¹	1
MTHSC 106 Cal. of One Var. I	4	MTHSC 108 Cal. of One Var. II	4
Humanistic/Social Science Elective ²	3	PHYS 122 Physics with Calculus I	3
	<u>17</u>	Elective	<u>3</u>
			18

¹One-half of the entering freshman class will enroll during the first semester, the other one-half will enroll during the second semester.

²See Policy on Humanities and Social Sciences for Engineering curricula

³See adviser

ENGINEERING ANALYSIS

This curriculum is a four-year engineering science-oriented course of study. Its objectives are two-fold. These are (1) to prepare a student for employment in areas of engineering activity requiring a high level of analytical competency, and (2) to provide a flexible undergraduate preparation for the study of engineering at the graduate level.

The curriculum leads to the Bachelor of Science degree in Engineering Analysis. Requirements for this degree are stated in terms of subject matter area rather than in terms of specific courses. Degree requirements are as follows:

See Freshman year above.

	Hours	Credit
Area of Concentration		12
Basic Science (including 8 hours of physics)		16
Engineering Science		33
Humanistic/Social Sciences		32
Mathematical Sciences (including 12 hours of post-calculus mathematical sciences)		24
Electives		<u>22</u>
Total Semester Hours		139

The educational objectives of the program will be met by the selection of an area of concentration which will be chosen from several

specialty areas offered within the professional engineering curricula. The selection of specific courses, particularly in the junior and senior years, will then depend primarily on the choice of the area of concentration. By judicious selection of courses within this flexible structure, a student may prepare himself for entry into the professional schools of law and medicine.

Maximum flexibility within this program is achieved by permitting a student to defer his choice of specialization until the junior year or later. Such deferral will then allow students from junior and senior colleges not offering engineering to transfer into the program with little or no loss in academic credit.

Note: Additional information concerning the Engineering Analysis curriculum is available in the Office of the Dean of Engineering.

AGRICULTURAL ENGINEERING

Graduates in Agricultural Engineering are well-equipped to apply engineering to many functions affecting the well-being of mankind. They have broad training in mathematics, physics, chemistry, and biological sciences as well as comprehensive coverage of the engineering sciences. Agricultural engineers are sought by industry and public service organizations primarily for their ability to apply engineering know-how to living systems and to the management of land and water resources. Specific areas of emphasis are as follows:

1. Agricultural Production and Consumer Products Engineering
2. Biotechnology Engineering
3. Food Engineering
4. Natural Resources Engineering

This major includes training in such engineering sciences as mechanics, fluids, thermodynamics, electrical theory, computing devices and systems analysis. Courses in the basic sciences as appropriate to the areas of emphasis provide a foundation for engineering design and development and for the management of biological systems. In addition, important facets of energy conversion, research methods, use of economy and integrity in design and protection, modification, and control of the environment are included.

Graduate programs lead to the Master of Science, Master of Engineering, and Doctor of Philosophy degrees.

Opportunities for employment of agricultural engineering graduates include design, research, production and sales with industry plus teaching, research, extension, and field engineer with state and federal agencies. Agricultural engineers are also equipped for self-employment as consulting engineers or as owners of businesses providing technical services and products.

See page 119 for Freshman year. See page 58 for separate emphasis curricula under Agricultural Engineering in the College of Agricultural Sciences.

SOPHOMORE YEAR

First Semester		Second Semester	
AGE 221 Survey for Soil and Water Res. ^{3,4}	2	AGE 214 Fab. and Mfg. Meth. for Ag. Sys.	2
CH 201 Organic Chemistry ^{2,5}	4	BIOCH 301 General Biochemistry ^{2,5}	3
EG 209 Intro. to Engr./Comp. Graphics	2	and BIOCH 302 Molec. Biol. Lab. I ^{2,5}	1
EM 201 Engr. Mechanics: Statics	3	ECON 211 Principles of Economics ^{1,3,4}	3
MTWSC 206 Calculus of Sev. Var.	4	or ECON 200 Economics Concepts ¹	3
PHYS 221 Physics with Cal. II	3	EM 202 Engr. Mechanics: Dynamics	3
PHYS 223 Physics Lab. II	1	MTWSC 208 Intro. to Ord. Diff. Equa.	4
Elective ^{2,5}	1	PHYS 222 Physics with Cal. III	3
Elective ^{3,4}	3	Literature Requirement ^{1,3,4}	3
	18	Elective ^{2,5}	2
			18

JUNIOR YEAR

AGE 356 Mach. Op. for Ag. and Biol. Sys. ^{3,4}	3	AGE 322 Small Watershed Hyd. and Sed. ^{3,4,2}	2
AGE (BIOSC) 430 Bioenerg. for Engr. ^{2,5}	4	AGE 333 Environ. Mod. and Cont. for Agric. and Biological Systems	2
ECE 307 Basic Electrical Engr.	2	AGE 350 Microcomp. Controls in Biosys.	2
ECE 309 Elec. Engr. Lab. I	1	AGE 362 Energy Conv. in Ag. and Biol. Sys.	3
ECON 211 Principles of Economics ^{1,2}	3	AGRON 202 Soils ^{3,4}	4
or ECON 200 Economic Concepts ¹	3	EM 320 Fluid Mechanics	3
EM 304 Mechanics of Materials	3	ENGL 314 Technical Writing ¹	3
ME 310 Thermodynamics and Heat Transfer	3	or SPCH 250 Public Speaking ¹	3
Biological Sciences Elective ^{1,4}	3	MICRO 305 General Microbiology ^{2,5}	4
Literature Requirement ^{1,2,5}	3	Elective ^{2,5}	2
Mathematics Elective ^{1,3,4,5}	3		19
Plant/Animal Science Elective ^{1,3}	3		
	18-19		

SENIOR YEAR

AGE 416 Mech. Des. for Ag. and Biol. Sys.	3	AGE 364 Agric. Waste Mgt. Sys. ⁴	2
AGE 450 Instru. for Ag. and Biol. Sys.	3	AGE 421 Engr. Sys. for Soil. Wat. Mgt. ^{3,4,5}	2
AGE 471 Engr. Research and Management	2	AGE 429 Appl. in Biotech. Engr. ^{2,5}	3
BIOSC 461 Cell Biology ⁵	4	AGE 431 Agric. Struc. and Environ. Des. ^{2,4}	3
CHE (AGE) 428 Biochemical Engr. ^{2,5}	3	AGE 442 Prop. and Proc. of Biol. Prod. ^{2,3,5}	3
FDSC 401 Food Chemistry I ²	4	ECON 211 Principles of Economics ^{1,5}	3
IE 384 Engineering Economic Analysis ³	3	or ECON 200 Economic Concept ¹	3
ME (AGE) 452 Safety Engineering ³	3	MICRO 407 Food and Dairy Microbio. ²	4
Approved Engineering Elective ^{1,4}	3	Approved Engineering Elective ^{1,2}	1
Humanistic-Social Elective ⁶	3	Humanistic-Social Elective ⁶	1
Science Elective ^{1,4}	3	Technical Elective ^{1,3,4}	3
	17-18	Elective ^{1,3,4}	4
		Elective ^{2,5}	2
			16-18

143 Total Semester Hours

¹See adviser

²Food Engineering Emphasis. (See page 60.)

³Agricultural Production and Consumer Products Engineering Emphasis. (See page 59.)

⁴Natural Resources Engineering Emphasis. (See page 61.)

⁵Biotechnology Engineering Emphasis. (See page 59.)

⁶See Policy on Humanities and Social Sciences for Engineering curricula

CERAMIC ENGINEERING

Window glass, implantable teeth, brick, ceramic bones, nuclear fuel, radomes, solid-state electronic devices, and bathroom fixtures are illustrations of the variety of products of the multibillion-dollar ceramic industry. Ceramic engineers are engineers to this industry, providing professional service in research, design, technical sales, production, and management.

The curriculum is an engineering curriculum with 75 percent of the course time devoted to coursework common to all engineers and 25 per-

cent to specialization in the field of ceramics. The core courses are in mathematics, basic science, engineering science, humanities, and social sciences. The specialized courses are in nonmetallic minerals, high-temperature chemistry, thermal processing, and material characterization.

The curriculum leads to the degree of Bachelor of Science in Ceramic Engineering. Graduate courses are offered leading to advanced degrees.

See page 119 for Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
CRE 202 Ceramic Materials	3	CRE 201 Intro. to Ceramic Engineering	2
CRE 204 Laboratory Procedures	1	MTHSC 208 Intro. to Ord. Diff. Equa.	4
CRE 310 Intro. to Material Science	3	PHYS 222 Phys. with Cal. III	3
MTHSC 206 Calculus of Sev. Var.	4	Literature Requirement ¹	3
PHYS 221 Phys. with Cal. II	3	Planned Elective ²	5
Literature Requirement ¹	3	Elective	1
Elective	1		18
	18		

JUNIOR YEAR

CH 331 Physical Chemistry	3	CRE 307 Thermal Processing of Ceramics	3
CRE 302 Thermo-Chemical Ceramics	3	CRE 309 Research Methods	2
CRE 304 Experiment Design	2	CRE 311 Kinetics of Mat. Processes	3
ECE 307 Basic Electrical Engineering	2	ECE 308 Electronics and Electromechanics	2
ECE 309 Elec. Engineering Lab. I.	1	ECE 310 Elec. Engr. Lab. II.	1
EM 201 Engr. Mechanics: Statics	3	Planned Elective ²	3
Planned Elective ²	3	Elective	3
	17		17

SENIOR YEAR

CRE 402 Solid State Ceramics	3	CRE 403 Glasses	3
EM 304 Mechanics of Materials	3	Planned Elective ²	14
SPCH 250 Public Speaking	3		17
Planned Elective ²	6		
Elective	2		
	17		

139 Total Semester Hours

¹ENGL 202, 203, 204, 205, 206, 207, 208, 209.

²Nine credits of planned electives must be taken in humanistic/social science courses. Nineteen credits of planned electives should be technical courses selected with the help of class adviser.

CHEMICAL ENGINEERING

Chemical Engineering is unique in that it is based on the three sciences of chemistry, physics, and mathematics. The curriculum emphasizes a broad range of fundamental principles in science and engineering, as well as communications skills and humanities, rather than a narrow specialization. As a result, graduates are avidly sought by industries in many areas of technology such as nuclear power, synthetic fibers and textiles, pharmaceuticals, pulp and paper, computers, foods, metals, ceramics, instrumentation and automatic control, and petroleum as well as the traditional chemical process industries. The chemical engineer is in the forefront of the fight against environmental pollution and is leading the way in applying engineering technology to the solution of medical and health-related problems. Advanced structural materials, electronic and photonic devices, and biotechnology are just some of the exciting new fields in which chemical engineers are making pivotal contributions.

The chemical engineering graduate, because of his broad, fundamental background, is uniquely prepared for a wide variety of careers in which he can apply his abilities and education. Chemical engineers may work in basic research and development, engineering design of new plants, operations and management of production facilities, or technical marketing and sales. The careers of many chemical engineers lead to top executive positions in their companies. By the judicious choice of electives made with the help of his adviser, a chemical engineering student may tailor his education to further a specific career objective. Many students use electives to prepare for entry into professional schools, such as medicine, dentistry, law, or business, or for specialization in technical areas such as environmental control or polymer processing. The Department of Chemical Engineering offers advanced study leading to the Master of Science and Doctor of Philosophy degrees.

See page 119 for Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
CH 223 Organic Chemistry	3	CH 224 Organic Chemistry	3
CHE 201 Intro. to Chem. Engr.	3	CH 229 Organic Chemistry Lab.	1
EG 209 Intro. to Engr./Comp. Graphics	2	CHE 220 Chemical Engr. Thermodynamics I	3
MTHSC 206 Calculus of Sev. Var.	4	EM 201 Engr. Mechanics: Statics	3
PHYS 221 Physics with Cal. II	3	MTHSC 208 Intro. to Ord. Diff. Equa.	4
Literature Requirement ¹	3	Literature Requirement ¹	3
	<u>18</u>	Elective	1
			<u>18</u>

JUNIOR YEAR

CH 331 Physical Chemistry	3	CH 332 Physical Chemistry	3
CH 339 Physical Chemistry Lab.	1	CH 340 Physical Chemistry Lab.	1
CHE 301 Unit Op. Theory I	3	CHE 302 Unit Op. Theory II	3
CHE 352 Proc. Mod. and Num. Methods	3	CHE 306 Unit Op. Lab. I	2
ECE 307 Basic Electrical Engr.	2	CHE 321 Chem. Engr. Thermo. II	3
ECE 309 Electrical Engr. Lab. I	1	CHE 353 Process Dynamics	3
EM 304 Mechanics of Materials	3	Social Science Elective ²	3
ENGL 314 Technical Writing	3		<u>18</u>
	<u>19</u>		

SENIOR YEAR

CHE 403 Unit Op. Theory III	3	CHE 401 Transport Phenomena	3
CHE 407 Unit Op. Lab. II	3	CHE 422 Process Dev., Design and Optimization of Chem. Engr. Sys. II	3
CHE 421 Process Dev., Design and Optimization of Chem. Engr. Sys. I	3	CHE 441 Chem. Engr. Senior Seminar II	0
CHE 440 Chem. Engr. Senior Seminar I	0	CRE 419 Sci. of Engr. Materials	3
CHE 450 Chem. Engr. Kinetics	3	MTHSC 425 Ortho. Functions and Boundary Value Problems	3
Social Science Elective ²	3	Humanistic/Social Elective ²	3
Elective	3	Elective	3
	<u>18</u>		<u>18</u>

144 Total Semester Hours

¹ENGL 202, 203, 204, 205, 206, 207, 208, 209.

²See Policy on Humanities and Social Sciences for Engineering Curricula, page 118.

CIVIL ENGINEERING

Civil Engineering involves the planning, design, construction, maintenance, and operation of facilities and systems to control and improve the environment for modern civilization. Civil engineering is the broadest of the engineering professions, being the stem from which most other branches of engineering have developed.

The program in Civil Engineering leads to the Bachelor of Science degree and is designed to equip the graduate with a knowledge of basic science, engineering science, and engineering design. The civil engineering graduate is prepared to work immediately upon graduation in practically any of the areas of the profession. These include traffic and transportation engineering, structural engineering, construction, soils and foundation engineering, ocean and coastal engineering, water resources engineering, public works engineering, environmental engineering, and others. The civil engineering student is also educated in the humanities, social sciences, and in economic issues. A concerned society demands economy as well as realistic consideration of the resulting human impacts on the engineer's endeavors.

Graduates are encouraged to become registered engineers and to continue their education throughout their professional careers. Many students find that programs in Civil Engineering provide excellent preparation for careers in technical sales and management.

See page 119 for Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
CE 201 Surveying	3	EG 209 Intro. to Engr./Comp. Graphics	2
EM 201 Engineering Mechanics: Statics	3	EM 304 Mechanics of Materials	3
MTHSC 206 Calculus of Sev. Variables	4	EM 305 Mechanics of Materials Lab	1
PHYS 221 Physics with Calculus II	3	MTHSC 208 Intro. to Ord. Diff. Eq.	4
Literature Requirement ¹	3	PHYS 222 Physics with Calculus III	3
Elective	1	Literature Requirement ¹	3
	<u>17</u>	Elective	1
			<u>17</u>

JUNIOR YEAR

CE 205 Civil Engr. Computer Applications	3	CE 302 Structural Steel Design	3
CE 301 Structural Analysis I	3	CE 310 Transportation Engineering	4
CE 320 Intro. to Cons. Materials	3	CE 324 Intro. to Construction Engr.	3
CRE 310 Intro. to Material Science	3	EM 320 Fluid Mechanics	3
EM 202 Engr. Mechanics: Dynamics	3	EM 322 Fluid Mechanics Lab	1
ENGL 314 Technical Writing	3	ESE 401 Environmental Engineering	3
	<u>18</u>		<u>17</u>

SENIOR YEAR

CE 330 Soil Mechanics	4	CE 402 Reinforced Concrete Design	3
CE 422 Hydraulics and Hydrology	3	CE 425 Engineering Relations	3
ECE 307 Basic Electrical Engineering	2	ME 310 Thermodynamics and Heat Transfer	3
ECE 309 Electrical Engineering Lab. I	1	Humanistic/Social Elective ²	3
ECON 200 Economic Concepts	3	Technical Elective ²	3
or ECON 211 or 212 Prin. of Econ.	3	Elective	3
Technical Elective ²	3		<u>18</u>
Elective	2		
	<u>18</u>		

140 Total Semester Hours

¹ENGL 202, 203, 204, 205, 206, 207, 208, 209.

²See adviser for list of approved Technical Electives and Humanistic/Social Science Electives.

COMPUTER ENGINEERING

The program in Computer Engineering leads to a Bachelor of Science degree which provides an indepth education into a wide range of computer topics including computer hardware, software and applications. Emphasis is placed on giving students hands-on experience with computers of all sizes (micro, mini, and large) by solving a wide range of real-world problems using engineering principles.

The career opportunities for computer engineers are excellent. The rapid advances in microelectronics and for growth of microcomputer applications, as well as continued expansion of large computer systems, indicate this strong demand will continue.

The curriculum is based on three main concepts: (1) It is an engineering curriculum which provides a solid foundation in mathematics, basic sciences, and the humanities while emphasizing the engineering approach to problem solving. (2) The required computer courses provide an excellent knowledge of hardware, software, and systems. (3) A large number of elective hours are provided which allows students to specialize in one or more computer areas. The Computer Engineering program prepares a student for entering the engineering profession in a rapidly advancing area, and it provides a good background for study in other professions.

See page 119 for Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
ECE 201 Logic and Comp. Devices	3	CPSC 210 Programming Methodology	4
ECON 200 Economic Concepts	3	ECE 202 Electric Circuits I	3
or ECON 211 or 212 Prin. of Econ.	3	ECE 203 Electric Circuits Lab. I	1
MTHSC 206 Cal. of Sev. Variables	4	ECE 250 Prin. of Digital Comp. Sys.	3
PHYS 221 Physics with Cal. II	3	MTHSC 208 Intro. to Ord. Diff. Equa.	4
PHYS 223 Physics Lab. II	1	MTHSC 311 Linear Algebra	3
Literature Requirement	3		18
	17		

JUNIOR YEAR

ECE 301 Electric Circuits II	3	ECE 321 Electronics II	3
ECE 303 Electric Circuits Lab. II	1	ECE 326 Electronics Lab. I	1
ECE 320 Electronics I	3	ECE 330 Elec. Sys. Analysis	3
ECE 329 Computer Systems Structures	3	ECE 425 Microcomputer Interfacing	3
SPCH 250 Public Speaking	3	MTHSC 400 Theory of Probability	3
or ENGL 314 Technical Writing	3	Humanities and Social Science Elective ²	3
MTHSC 419 Discrete Math. Structures I	3	Elective	3
Engineering Science Elective ¹	3		19
	19		

SENIOR YEAR

ECE 417 Software Design	3	ECE 405 Design Projects in ECE	2
ECE 429 Computer Organization	3	Computer Engineering Elective ¹	3
ECE 450 Comp. System Design Proj.	2	Design Elective ¹	6
Engineering Science Elective ¹	3	Humanities and Social Science Elective ²	3
Humanities and Social Science Elective ²	3	Major Design Course ¹	3
Elective	4		17
	18		

143 Total Semester Hours

¹Must be chosen from a list of courses approved by the department

²The University General Education Requirements may influence course selection here

Note. In the Department of Electrical and Computer Engineering, a student is allowed to enroll in a departmental course, excluding ECE 307, 308, 309, and 310, only when all prerequisites for that course have been passed with a grade of C or higher.

ELECTRICAL ENGINEERING

Responsibilities of the electrical engineering profession range from highly analytical problem solving to detailed design. The Electrical Engineering program is intended to emphasize both the close relationship of computers to all phases of the profession and the major role that computers play in the curriculum at Clemson.

Systems, electronic networks, and electromagnetic fields provide the core curriculum areas. These fundamental studies in analysis and experimentation receive further development in elective courses. Humanistic/social electives provide the graduate with the ability to address himself to the "why" of engineering as well as the "how."

Students who are interested in communications study information theory, electromagnetic theory, switching circuits, and electronics.

Technological innovations in electronics have resulted in increasingly complex solid-state components—the transistor, integrated circuit, and LSI component. The electronics emphasis includes solid-state devices and circuits and integrated circuit technology.

The department offers courses in real-time computing, computer language structures, theory and design of digital computers, computation and simulation of physical systems, and information processing and data handling.

Energy systems analysis and energy conversion are appropriate for students who plan to work for electric utilities, electrical equipment manufacturers, or companies which are large users of electrical energy.

See page 119 for Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
ECE 201 Logic and Comp. Devices	3	ECE 202 Electric Circuits I	3
ECON 200 Economic Concepts	3	ECE 203 Electric Circuits Lab. I	1
or ECON 211 or 212 Prin. of Econ.	3	ECE 250 Prin. of Digital Computer Systems	3
EM 201 Engr. Mechanics: Statics	3	EM 202 Engr. Mechanics: Dynamics	3
MTHSC 206 Calculus of Sev. Var.	4	MTHSC 208 Intro. to Ord. Diff. Equa.	4
PHYS 221 Phys. with Cal. II	3	PHYS 222 Physics with Cal. III	3
Literature Requirement ¹	3	Physics Lab Requirement ²	1
	<u>19</u>		<u>18</u>

JUNIOR YEAR

ECE 301 Electric Circuits II	3	ECE 302 Linear Control Systems	3
ECE 303 Elec. Circuits Lab. II	1	ECE 321 Electronics II	3
ECE 317 Rand. Analysis of Elec. Sys.	3	ECE 326 Electronics Lab. I	1
ECE 320 Electronics I	3	ECE 330 Elec. Sys. Analysis	3
ECE (PHYS) 340 Electromagnetics I	2	ECE (PHYS) 341 Electromagnetics II	2
ENGL 314 Technical Writing	3	ECE 360 Electric Power Engineering	3
or SPCH 250 Public Speaking	3	ME 310 Thermodynamics and Heat Transfer	3
Humanistic/Social Elective ³	3		
	<u>18</u>		<u>18</u>

SENIOR YEAR

ECE 451 System Design Project	2	Humanistic/Social Elective ³	3
Humanistic/Social Elective ³	3	Technical Elective ⁴	9
Technical Elective ⁴	9	Elective	4
Elective	3		
	<u>17</u>		<u>16</u>

141 Total Semester Hours

¹ENGL 202, 203, 204, 205, 206, 207, 208, 209.

²PHYS 223 or 224

³See College of Engineering Policy on Humanities and Social Science, page 118.

⁴These courses must include a minimum of 10 hours of design content, as determined from the department list. Note: In the Department of Electrical and Computer Engineering, a student is allowed to enroll in a departmental course, excluding ECE 307, 308, 309, and 310, only when all prerequisites for that course have been passed with a grade of C or higher.

INDUSTRIAL ENGINEERING

Industrial engineers design, install, and improve the complex systems which provide both goods and services vital to our society and economy. These systems integrate people, materials, and equipment and thereby place unique demands for breadth of preparation upon industrial engineers. Knowledge is required in mathematical, physical, and social sciences; economic, operational, and engineering analyses; and the principles and techniques of engineering design. Because of the closeness of industrial engineering problems to management, a special need exists for industrial engineers to be able to work and communicate with managers.

The traditional arenas for the practice of industrial engineering are the manufacturing facilities of industry. However, today fully one-third of practicing industrial engineers are employed in nonmanufacturing institutions such as hospitals and banks and in government service.

In addition to numerous employment opportunities in South Carolina and other states, an industrial engineering graduate may pursue further formal education. The Department of Industrial Engineering offers programs leading to the Master of Science and Doctor of Philosophy degrees.

See page 119 for Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
EG 209 Intro. to Engr./Comp. Graphics	2	EM 201 Engineering Mechanics: Statics	3
MTHSC 206 Calculus of Several Var.	4	IE 301 Work Methods and Measurement I	3
MTHSC 301 Stat. Theory and Methods I	3	IE 350 Model. and Analysis for Ind. Engr.	3
PHYS 221 Physics with Cal. II	3	IE 384 Engineering Economic Analysis	3
Literature Requirement ³	3	MTHSC 208 Intro. to Ord. Diff. Equa.	4
Composition Elective ²	3	Basic Science Elective ⁴	3
	18		19

JUNIOR YEAR

ECE 307 Basic Electrical Engineering	2	IE 361 Industrial Quality Control	3
ECE 309 Electrical Engineering Lab. I	1	IE 473 Microcomp. Appl. in Ind. Engr.	3
EM 304 Mechanics of Materials	3	IE 481 Meth. of Operation Research II	3
IE 306 Manufacturing Processes	3	IE 482 Systems Modeling	3
IE 480 Meth. of Operation Research I	3	ME 310 Thermodynamics and Heat Transfer	3
MTHSC 405 Stat. Theory and Methods II	3	Humanistic/Social Science Elective ¹	3
Humanistic/Social Science Elective ¹	3		18
	18		

SENIOR YEAR

FIN 306 Corporation Finance	3	IE 465 Facilities Planning and Design	4
IE 486 Production Planning and Control	3	Technical Elective ⁴	6
IE 488 Human Factors Engineering	3	Elective	7
Humanistic/Social Science Elective ¹	3		17
Technical Elective ⁴	6		
	18		

143 Total Semester Hours

¹See Policy on Humanities and Social Sciences for engineering curricula.

²ENGL 231, 312, 314, 316, SPCH 250.

³ENGL 202, 203, 204, 205, 206, 207, 208, 209

⁴Select from an approved list. (See adviser.)

MECHANICAL ENGINEERING

Breadth, individuality, and flexibility are inherent characteristics of the profession of mechanical engineering. Mechanical engineers, in a broad sense, make major contributions to the creation of products and systems

that benefit mankind. They work in a wide variety of areas including bioengineering, energy systems, environmental and life-support systems, propulsion and transportation systems, food production, materials processing, automated manufacturing, and construction. A wide spectrum of career opportunities are open to them.

The practice of mechanical engineering includes one or more of the following activities: manufacturing, testing, research, development, design, technical management, technical sales and marketing, construction, and teaching.

In preparing for a 40-45 year professional career, it is necessary to develop the whole person. This requires a balanced program encompassing the humanities, social sciences, communication and computer skills, physical and engineering sciences, design, and laboratory experience. The student starts with the physical sciences and communication skills and progresses through the engineering sciences, ultimately applying the principles learned in such areas as energy conversion and transfer, mechanical design, and systems analysis. Throughout the curriculum, the fundamental nature of engineering as a problem-solving discipline is emphasized.

Most mechanical engineering graduates take positions in industry, government, or business. Many, however, continue their formal education in a graduate program. The Department of Mechanical Engineering offers study leading to the Master of Engineering, Master of Science, and Doctor of Philosophy degrees.

See page 119 for Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
CRE 310 Intro. to Material Science	3	EM 202 Engr. Mechanics: Dynamics	3
EG 208 Engr. Graphics with Computer Appl.	3	ME 202 Engr. Mat. and Manuf. Proc.	2
EM 201 Engr. Mechanics: Statics	3	ME 208 Numerical Method in Engr.	3
ME 201 Foundations of Engr. Design	2	MTHSC 208 Intro. to Ord. Diff. Equations	4
MTHSC 206 Calculus of Several Var	4	PHYS 222 Physics with Calculus III	3
PHYS 221 Physics with Calculus II	3	Literature Requirement ¹	3
	<u>18</u>		<u>18</u>

JUNIOR YEAR

ECE 307 Basic Elec. Engineering	2	ECE 308 Elec. and Electromechanics	2
ECE 309 Electrical Engr. Lab. I	1	ECE 310 Electrical Engr. Lab. II	1
EM 304 Mechanics of Materials	3	ENGL 314 Technical Writing	3
EM 305 Mechanics of Materials Lab	1	ME 304 Heat Transfer	3
EM 320 Fluid Mechanics	3	ME 306 Fundamentals of Machine Design	3
ME 302 Dynamic Systems Modeling	3	ME 312 Engineering Thermodynamics II	3
ME 311 Engineering Thermo. I	3	ME 313 Instrumentation and Measurement	3
	<u>16</u>		<u>18</u>

SENIOR YEAR

ME 400 Senior Seminar	1	ME 402 Intern. in Engr. Design	2
ME 405 Kinematics and Dyn. of Machinery I	3	ME 414 Mech. Sys. Lab	1
ME 412 Intro. to Comp. Flow and Turbomachinery	3	or ME 413 Thermal Sys. Lab	1
ME 413 Thermal Systems Lab	1	Humanistic/Social Elective ²	6
or ME 414 Mech. Sys. Lab	1	Technical Elective ³	6
Humanistic/Social Elective ²	3	Elective	3
Technical Elective ³	3		<u>18</u>
Elective	4		
	<u>18</u>		

141 Total Semester Hours

¹Select from 200-level English literature or 300-level foreign language literature courses.

²Select from a list of approved Humanistic/Social electives

³Select from the departmental list of approved Technical Electives with the assistance of a faculty adviser

COLLEGE OF FOREST AND RECREATION RESOURCES

The College of Forest and Recreation Resources is concerned with the management, use, and stewardship of all our forest resources and with individual and societal well-being through wise use of leisure. These two general areas of study offer broad opportunities in the management of our forest and recreation resources for their maximum service to present and future generations.

The College of Forest and Recreation Resources offers curricula designed to prepare students for professional careers in the following areas:

1. The Forest Management curriculum prepares graduates for employment as managers and administrators of forest lands for production of timber, water, wildlife, esthetic values, and recreation use.

2. The Forest Products curriculum prepares graduates for careers in the forest products and allied industries in the areas of production, utilization, and marketing of wood and allied products.

3. The Parks, Recreation, and Tourism Management curriculum prepares graduates for careers as managers of leisure-service programs such as those for counties, municipalities, institutions, voluntary and youth-serving agencies, and for various opportunities within the travel and tourism industry as well as resource management systems at local, state, and federal levels.

Minor concentrations are offered in Forest Management and Wood Utilization.

FOREST MANAGEMENT

The Forest Management curriculum combines a broad education in the arts and sciences with the applied forest sciences. This combination provides the necessary foundation for the scientific management of forest resources, products, and services.

Because of the nature of their education, foresters are qualified for a broad spectrum of employment opportunities in both the public and private sectors. They may be engaged as managers, administrators, or owners of forest lands or forest-based businesses; as technical specialists in the production of timber, useable water, wildlife, and esthetic values, and in the recreational use of the forest; or as professionals in other areas where the conservation of our natural resources is a matter of concern. Foresters earning advanced degrees find employment in academic work and in research conducted both by public and private agencies.

The undergraduate curriculum provides a strong program in the basic knowledge and skills required of a professional forester. The curriculum is also designed to provide the necessary prerequisites for those students who desire to continue in graduate study. The Department of Forestry offers graduate programs that lead to the Master of Science, Master of Forestry, and Doctor of Philosophy degrees.

The Forest Management curriculum is accredited by the Society of American Foresters.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	3	BOT 205 Plant Form and Function	4
CH 101 General Chemistry	4	CH 102 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
FOR 101 Intro. to Forestry	1	FOR 103 Society, Conservation, and Forestry	2
Mathematics Requirement ¹	3	Mathematics Requirement ¹	3
Elective	3		
	17		16

SOPHOMORE YEAR

AGRON 202 Soils	4	FOR 206 Silvics	4
FOR 205 Dendrology	3	PHYS 200 Introductory Physics	4
Computer Science Requirement ²	3	Business Requirement ²	3
Literature Requirement ³	3	Economics Requirement ²	3
Elective	3	Social Science Requirement ⁴	3
	16		17

FORESTRY SUMMER CAMP

FOR 251 Forest Plants	1
FOR 252 Forest Engineering	3
FOR 253 Forest Mensuration	4
FOR 254 Forest Products	1
	9

JUNIOR YEAR

ENGL 314 Technical Writing	3	FOR 302 Forest Mensuration	3
FOR 304 Forest Economics	3	FOR 310 Silviculture	4
FOR 306 Wood and Wood Fiber Ident.	2	FOR 412 Forest Protection	2
FOR 308 Aerial Photographs in Forestry	3	FOR 420 Forest Products	3
Statistics Requirement ⁵	3	SPCH 250 Public Speaking	3
Elective	3	Elective	2
	17		17

SENIOR YEAR

FOR 407 Forest Operations	3	FOR 409 Multiple-Use Forestry	2
FOR 413 Integrated Forest Pest Mgt.	4	FOR 414 Forest Management Plans	2
FOR 416 Forest Policy and Administration	2	FOR 415 Forest Wildlife Management	3
FOR 417 Forest Mgt. and Reg.	3	FOR 432 Forest Site Capability	2
FOR 418 Forest Valuation	3	Humanities Requirement ⁴	3
Elective	2	Elective	5
	17		17

143 Total Semester Hours

¹A student with a College Board Mathematics Achievement Test, Level II score of 550 or greater may take MTHSC 106 to satisfy the Mathematics Requirement, otherwise, MTHSC 102 and 207 are required.

²See adviser.

³ENGL 202, 203, 204, 205, 206, 207, 208, 209

⁴See page 53

⁵EXST 301, MTHSC 203 or 301.

FOREST PRODUCTS

The Forest Products curriculum combines a broad education in the sciences and humanities. Emphasis in the professional courses is placed on the properties and use of wood. Graduates are employed by wood-using industries and their suppliers, research laboratories, trade associations, and state and federal organizations.

The core curriculum allows for emphases in three areas of specialization: Wood Science, Wood Industries Management, and Forest Management. Wood Science deals with the properties and processing of wood, wood fiber, and products derived from wood. Wood Industries Management prepares students for the managerial aspects of forest products industries, including marketing and technical services. Twelve credit hours listed as emphasis areas in the core curriculum qualify a student

as a participant in one of the two areas. The areas of interest could be explored in more depth through use of the remaining elective credits.

Successful completion of the curriculum leads to a Bachelor of Science degree in Forest Products. Graduate studies leading to the Master of Science, Master of Forestry, and Doctor of Philosophy degrees are also offered.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	3	BOT 205 Plant Form and Function	4
CH 101 General Chemistry	4	CH 102 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
Mathematics Requirement ¹	3	FOR 103 Society, Conserva. and Forestry	2
Elective	3	Mathematics Requirement ¹	3
	<u>16</u>		<u>16</u>

SOPHOMORE YEAR

FOR 205 Dendrology	3	FOR 222 Wood Properties II	3
FOR 221 Wood Properties I	3	PHYS 208 General Physics II	4
PHYS 207 General Physics I	4	Economics Elective ²	3
Computer Science Elective ²	3	Social Science Elective ⁴	3
Literature Elective ³	3	Elective	5
Elective	1		<u>18</u>
	<u>17</u>		

FORESTRY SUMMER CAMP

FOR 254 Forest Products	1
FOR 255 Secondary Wood Products	1
FOR 257 Forest Products Measurements	2
	<u>4</u>

JUNIOR YEAR

FOR 304 Forest Economics	3	ENGL 314 Technical Writing	3
FOR 306 Wood and Wood Fiber Identification	2	FOR 322 Wood Adhesives and Finishes	2
FOR 321 Drying and Machining of Wood	3	FOR 323 Deterioration and Preservation of Wood	2
FOR 325 Chem. Aspects of Wood Util.	3	MGT 404 Adv. Statistical Quality Control	3
Emphasis Area Elective ⁶	3	SPCH 250 Public Speaking	3
Statistics Elective ⁵	3	Emphasis Area Elective ⁶	5
	<u>17</u>		<u>18</u>

SENIOR YEAR

FOR 407 Forest Operations	3	FOR 409 Multiple-Use Forestry	2
FOR 429 Wood Design	3	FOR 411 Harvest For. Prod.	3
FOR 430 Composite Wood Materials	3	FOR 420 Forest Products	3
Emphasis Area Elective ⁶	4	FOR 434 Foreign Woods and Their Prop.	2
Elective	5	Humanities Elective ⁴	3
	<u>18</u>	Elective	4
			<u>17</u>

141 Total Semester Hours

¹A student with a SAT Mathematics Achievement Test, Level II score of 550 or greater may take MTHSC 106 to satisfy the Mathematics Requirement, otherwise, MTHSC 102 and 207 are required

²To be selected in consultation with advisers.

³ENGL 202, 203, 204, 205, 206, 207, 208, 209.

⁴See page 53

⁵EXST 301, MTHSC 203, 301

⁶Emphasis Areas are Wood Industries Management, Wood Science, and Forest Management. Select one of these in consultation with adviser

PARKS, RECREATION, AND TOURISM MANAGEMENT

The curriculum in Parks, Recreation, and Tourism Management prepares students for a variety of careers in public and private leisure-service agencies. The undergraduate curriculum is designed to provide a

broad exposure to the social, physical and biological sciences as well as to develop the basic knowledge and skills required to manage and administer leisure-service resources.

Flexibility within the curriculum is achieved by permitting the student to select coursework from among four emphasis areas that include Community Leisure Services, Recreation Resource Management, Therapeutic Recreation, and Travel and Tourism. The latitude in selection permits maximum accommodation of the individual student's interests and professional career objectives. Students may complete requirements for a minor appropriate to his/her emphasis area.

Graduate study leading to a Master of Parks, Recreation, and Tourism Management; Master of Science; and Doctor of Philosophy is offered.

The Parks, Recreation, and Tourism Management program is accredited by the National Council on Accreditation of the National Recreation and Parks Association in conjunction with the Council on Postsecondary Accreditation.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	3	BIOL 104 General Biology II	3
BIOL 105 General Biology Lab. I	1	BIOL 106 General Biology Lab. II	1
ENGL 101 Composition I	3	ENGL 102 Composition II	3
PRTM 101 Introduction to Leisure Services	3	PRTM 203 Personal and Community Health	3
History Requirement ¹	3	PRTM 205 Leisure Programs I	3
Mathematics Requirement ¹	3	Mathematics Requirement ¹	3
Elective	1	Elective	1
	<u>17</u>		<u>17</u>

SOPHOMORE YEAR

CPSC 120 Intro. to Info. Proc. Systems	3	ECON 200 Economic Concepts ³	3
PRTM 102 Issues in Leisure Services	3	PRTM 207 Leisure Programs III	1
PRTM 206 Leisure Programs II	1	PRTM 311 Therapeutic Recreation	3
PSYCH 201 Introduction to Psychology	3	Humanities Requirement ¹	3
Literature Requirement ²	3	Social Science Requirement ¹	3
Science Requirement ⁴	4	Elective	3
	<u>17</u>		<u>16</u>

JUNIOR YEAR

PRTM 308 Leadership and Group Processes in Recreation	3	PRTM 321 Recreation Administration	3
PRTM 330 Intro. to Environmental Interpretation	3	Emphasis Area	8
Communication Requirement ¹	3	Elective	4
Emphasis Area	6		<u>15</u>
	<u>15</u>		

SUMMER

PRTM 405 Field Training in Recreation 8

SENIOR YEAR

PRTM 409 Meth. of Recreation Research I	3	PRTM 410 Meth. of Recreation Research II	3
Emphasis Area	9	Emphasis Area	9
Elective	3	Elective	3
	<u>15</u>		<u>15</u>

135 Total Semester Hours

¹See pages 52-53

²ENGL 202, 203, 204, 205, 206, 207, 208, 209.

³The student may take ECON 211 and 212 with 3 (of the 6) credits allocated to electives.

⁴Laboratory science courses. (See adviser.)

MINOR CONCENTRATIONS

Forest Management A minor in Forest Management requires either of the following:

1. Credits from the following: FOR 305, 310, 315, and a minimum of 6 credits, selected with a forestry faculty adviser's approval, from any forestry course (for a total of 15 credits).
2. A formal program of study developed by the student and forestry adviser, containing a minimum of 15 credits of forestry courses.

Wood Utilization A minor in Wood Utilization requires 18 semester credits from the following: FOR 221, 315, 420, and a minimum of 9 credits, selected with a forestry faculty adviser's approval, from 300- and 400-level forestry courses.



Wood Workshop 1937

COLLEGE OF LIBERAL ARTS

The College of Liberal Arts, in addition to its eight major curricula leading to the degree of Bachelor of Arts, makes indispensable contributions to the programs of all other divisions of the University, including nearly all the instruction in the humanities and the social sciences. The College of Liberal Arts also offers programs leading to graduate degrees in English, History, and Psychology.

BACHELOR OF ARTS CURRICULUM

The curriculum leading to the degree of Bachelor of Arts is designed to meet the needs of students who desire a broad general education, with emphasis upon the humanities and the social sciences, as a preparation for intelligent citizenship, for general commercial and industrial life, for government service, and for teaching. This curriculum also provides excellent background for the study of law, journalism, or medicine.

As soon as feasible and not later than the end of the sophomore year, the student seeking the Bachelor of Arts degree will select a major and a minor field of concentration from the following areas (or a double major from the list of possible majors)¹:

Majors

English
History
Language and
 International
 Trade
Modern Languages
Philosophy
Political Science
Psychology
Sociology

Minors

Accounting	Modern Languages
American Studies	Music
Biological Sciences	Philosophy
Chemistry	Physics
Cluster Minor	Political Science
Communications	Psychology
Computer Science	Religion
Economics	Science and Technology in Society
English	Sociology
Fine Arts	Spanish American Area Studies
Forest Management	Speech
Geography	Theatre
Geology	Women's Studies
History	Wood Utilization
International Studies	Writing
Marketing	
Mathematical Sciences	

¹ The Language and International Trade major does not require a minor and may not be used in the double major program

To achieve depth as well as breadth in his/her educational experience, a student selects a major concentration consisting of at least 24 semester hours from courses above the sophomore level. A student also chooses a minor concentration consisting of at least 15 additional semester hours. Courses satisfying the student's major concentration may not also be included in the minor. The minor field of study may be selected from the approved list of minors within the College of Liberal Arts and of minors outside the College. A second major concentration (a double major) may substitute for the minor, provided all requirements are

fulfilled for each major. This applies equally to a second major in a BA field outside the College of Liberal Arts, such as the Colleges of Architecture, Commerce and Industry, Education, and Sciences.

The total number of semester credits required for the degree is 130, except for Language and International Trade, which requires 133. Of these, at least 12 credits must be earned in humanities courses numbered 300 or higher (MUS 210 excepted) and at least 12 credits in social science courses numbered 300 or higher. The humanities are for this purpose considered to include art and architectural history, English (except 304, 312, 314, 316, 331, 333, 334, 335, 392, 485, 490), languages, music, philosophy, religion, and speech (except 364), as well as courses entitled humanities; the social sciences are here considered to include anthropology, economics, geography, history, political science, psychology, and sociology.

Students in the Bachelor of Arts program who expect to teach in the public schools may elect education courses required for teaching certificates by the South Carolina State Department of Education. Such courses are to be approved by their own department advisers.

BASIC CURRICULUM

FRESHMAN YEAR

First Semester		Second Semester	
ENGL 101 Composition I	3	ENGL 102 Composition II	3
HIST 172 Western Civilization	3	HIST 173 Western Civilization	3
MTHSC 101 Finite Probability ¹	3	MTHSC 102 Intro. to Math. Analysis ¹	3
Foreign Language	4	Same Foreign Language	4
Physical or Biological Science ²	4	Physical or Biological Science ²	4
	<u>17</u>		<u>17</u>

SOPHOMORE YEAR

Same Foreign Language	3	Same Foreign Language	3
Literature Requirement ³	3	Literature Requirement ³	3
Elective	12	Elective	10
	<u>18</u>		<u>16</u>

JUNIOR YEAR

Composition and Speaking Skills ⁴	3	Applied Science ⁴	3
Major and Minor Areas	9	Major and Minor Areas	12
Elective	3		15
	<u>15</u>		

SENIOR YEAR

Major and Minor Areas	9	Major and Minor Areas	9
Elective	8	Elective	6
	<u>17</u>		<u>15</u>

130 Total Semester Hours

¹Students may pursue alternate sequences such as the following: MTHSC 101 and 106 or 203, 102 and 207, or 106 and 108, 207, 210, 301, 308. Sociology majors must take either MTHSC 101 and 203 or 106 and 301.

²A two-semester sequence of the same physical or biological science (astronomy, biology, chemistry, geology, or physics) totaling at least 8 semester credits, including the appropriate laboratory course.

³ENGL 202, 203, 204, 205, 206, 207, 208, 209.

⁴See pages 52-53

MAJOR CURRICULA IN THE COLLEGE OF LIBERAL ARTS

ENGLISH

The purposes of a major in English are to help students acquire an understanding of our literary heritage; develop an appreciation and practical knowledge of the modes of literary expression, research, and criticism; improve their ability to write effectively and intelligently; gain insights into literature as a humane study; and prepare for advanced work in English language, literature, and related disciplines.

The program of study for a major concentration in English consists of courses stipulated in the basic curriculum¹ for the Bachelor of Arts and 25 semester credits of English, arranged as follows:

Group I ENGL 190 and 411.

Group II Three credits from ENGL 405, 407, 408, 409, 410, 412, 413, 414.

Group III Three credits from ENGL 406, 415, 416, 417, 418.

Group IV Three credits from ENGL 422, 423, 424, 425.

Group V Twelve additional credits from 300- and 400-level courses, at least 6 credits from the 400 level.²

The department requires proficiency in composition for all of its majors and minors. English majors or minors with writing problems must overcome them in the Writing Laboratory.

English majors must complete one of the following sequences of courses: HIST 361, 363; 316, 361; 316, 363; or 316, 365.

English majors must also fulfill a requirement in philosophy or religious studies by completing one of the following courses: PHIL 101, 102, 103, REL 101.

English majors must fulfill a fine arts requirement by completing one of the following courses: CAAH 101, 205, 206, HUM 301, 302, 306, MUS 210, 311, 315, 316.

Electives are added as necessary to meet the minimum number of 130 credits for graduation.

¹The Department suggests that English majors take ENGL 203 and 204 or 207 and 208 to satisfy the sophomore literature requirement.

²No course may be used toward the satisfaction of both major and minor requirements.

DEPARTMENTAL OFFERINGS

Because the English Department houses disciplines and courses often given separate departmental and course identity elsewhere, the following list of offerings will indicate the range and types of subjects bearing an English number in this catalog and in schedule booklets.

To find descriptions for all of the courses listed below, turn to page 236.

Freshman English ENGL 100, 101, H101, 102, H102.

Sophomore Literature ENGL 202, 203, H203, 204, H204, 205, H205, 206, H206, 207, 208, 209.

Literature ENGL 353, 356, 385, 386, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 422, 423, 424, 425, 426, 430, 431, 432, 435, 437, 455.

Advanced Writing ENGL 304, 312, 314, 345, 346, 347, 392, 445, 446, 447, 485, 490.

Linguistics ENGL 111, 217, 300, 400, 401.

Journalism ENGL 231, 331, 333, 334, 335.

Special Topics ENGL 350, 351, 355, 357.

HISTORY

The recommended program of study consists of the required courses in the Bachelor of Arts curriculum and 30 additional credits in history, including at least two courses at the 400 level, selected with the advice and consent of a departmental adviser and arranged to suit the academic interests of the student. Additional electives are added as needed to meet the minimum of 130 semester credits required for graduation.

Prelaw students majoring in History should consult the departmental adviser for prelaw for a recommended program.

LANGUAGE AND INTERNATIONAL TRADE

The Bachelor of Arts degree program in Language and International Trade combines foreign languages and international marketing. Students choose one language (French, German, Spanish) and one professional option (Global Marketing, International Agricultural Trade, International Forest Products Marketing, International Textile Marketing, and International Tourism).

A summer internship between the junior and senior years gives students the opportunity to apply classroom learning to a business/industrial work environment. Language and International Trade majors are also encouraged to participate in Study Abroad programs in order to increase their language proficiency.

Students should confer with the Language and International Trade director for specific course requirements involving the various language options and the chosen professional concentration. All options require ENGL 316, L&IT 400, MKT 127, 301, 427.

The 133 semester-hour curriculum, which includes at least 24 hours at the 300-400 level in the language track and also in the professional concentration, is outlined below.

The language component emphasizes speaking and writing skills, culture, civilization, and business/technical language. Students are required to take the courses listed under one of the following languages:

French 101, 102, 201, 202, 305, 307, 316, 411, 416, plus 6 credits of French electives at the 300-400 level and L&IT 400.

German 101, 102, 201, 202 or 251, 305, 307 or 413, 316, 411, 416, plus 6 credits of German electives at the 300-400 level and L&IT 400.

Spanish 101, 102, 201, 202, 305, 308 or 307 or 435, 316, 411, 416, plus 6 credits of Spanish electives at the 300-400 level and L&IT 400.

The professional component emphasizes international marketing in areas important to the economy of the state and the nation. Students are required to take the courses listed under one of the following professional options:

Global Marketing ECON 211, 212, 412, MGT 301, 423, 424, MKT 301, 402, 427, 437.

International Agricultural Trade AGECE 202, 309, 319, 420, 452, AGRIC 301, 401, ECON 212, 412, MKT 301, 427.

International Forest Products Marketing ECON 211, 212, 412, FOR 311, 324, 419, 420, 422, MKT 301, 427.

International Textile Marketing MKT 301, 402, 423, 427, 437, TEXT 308, 314, 322, 460, 472.

International Tourism Marketing MKT 301, 402, 423, 427, 437, PRTM 342, 343, 444, 447, plus 3 additional credits in PRTM at the 300-400 level, approved by the Language and International Trade Director, preferably PRTM 401, 403, or 441.

MODERN LANGUAGES

A student may elect a major concentration in a single language, a double major in two languages, or a double major combining a language major with a Bachelor or Arts major outside the department. All Modern Language majors will choose one of the following options:

Option A Designed to prepare the student to continue education in graduate school or to provide background for other professional language careers, Option A requires the courses specified below plus 3 credits in history at the 300-400 level, selected with the approval of the Head of the Department of Languages.

Option B Designed to prepare for teaching in secondary schools, Option B requires the courses specified below plus coursework in education to meet certification requirements.

Option C Option C is designed to prepare for a career in business. Modern Language majors seeking employment with multinational firms in the United States and overseas, or pursuing graduate degrees in international business studies, economics, or agricultural economics may have one of the following:

a) A double major with Economics.

b) A Cluster Minor in Administration.

c) A minor in Accounting, International Studies, or Spanish-American Area Studies.

Option D Option D is designed to permit students to obtain a double major by combining either French, German or Spanish with any other major in the College of Liberal Arts or with any Bachelor of Arts degree program in the University. All requirements for each major must be fulfilled.

All Modern Language majors must complete the stipulated courses in the basic Bachelor of Arts curriculum.

French All options require FR 205 and 209 plus 24 semester credits in French at the 300-400 level appropriate to the option and approved by the Head of the department. Option A requires 6 credit hours of 400-level literature courses, and Options B and C require 6 credit hours in literature courses, of which 3 hours must be at the 400 level.

German All options require 24 semester credits in German at the 300-400 level appropriate to the option and approved by the Head of the department.

Spanish All options require 30 semester hours at the 300-400 levels, of which 9 hours must be at the 400 level. A minimum of 6 hours of literature, including one course at the 400 level, is also required.

Department requirements for all options: 3 credits from art and architectural history, music, or drama (practica with approval of department head).

PHILOSOPHY

The recommended course of study consists of the Bachelor of Arts curriculum, one philosophy course at the 100 level (PHIL 101, 102 or 103), both PHIL 315 and 316, and 24 additional credits in philosophy courses numbered 300 or higher, including at least one 3-credit course at the 400 level, selected with the advice and consent of a departmental adviser and arranged to suit the academic interests of the student. REL 309 may be counted toward the major. Additional electives are added as needed to meet the minimum of 130 semester credits required for graduation.

POLITICAL SCIENCE

The requirements for the major in Political Science consist of the required POSC 101, 201, 341; plus at least 21 additional semester hours of political science at the 300 or 400 level, including at least one course from four of the following five fields:

American Government POSC 403, 405, 432, 442.

Comparative Politics POSC 371, 373, 471, 475, 476.

International Relations POSC 361, 428, 462, 463, 465.

Political Theory POSC 351, 352, 453.

Public Policy and Public Administration POSC 302, 321, 422.

The student's elective hours in political science are chosen with the consent and advice of the departmental adviser to ensure an appropriate balance of breadth and specialization within the field of political science. In addition to the courses listed above, the department offers a wide range of specialized courses in each of the subfields of the Political Science discipline, including:

American Government POSC 408, 409, 433, 434, 435, 443, 448, 454.

International Relations/Comparative Politics POSC 379, 468, 472, 476.

Public Policy and Public Administration POSC 423, 425, 427.

Other Courses POSC 310, 311, 312, 457, 482.

Note: No more than 3 hours credit from POSC 310, 311, or 312 may be applied to the requirements for a Political Science major

PSYCHOLOGY

The recommended program of study for a major concentration in Psychology consists of the required courses in the Bachelor of Arts curriculum; PSYCH 201, 210, 310; and 24 additional credits in psychology including at least two courses at the 400 level and selected as follows.

At least one course from each of the following groups and 8 additional credits at the 300-400 level.

Group I PSYCH 320-321, 422-423, 424-425.

Group II PSYCH 330, 333, 415.

Group III PSYCH 340, 343, 345.

Group IV PSYCH 352, 355, 364.

Group V PSYCH 370, 471, 483.

It is recommended that Psychology majors take MTHSC 101, 203, or 106, 108. Zoology 470 may be included in lieu of one 300- or 400-level elective psychology course.

SOCIOLOGY

The Sociology major consists of the required courses in the Bachelor of Arts curriculum (Sociology majors must take MTHSC 101 and 203 or 106 and 301), SOC 201, 404, either 460 or 461, SOC (RS) 303, and 21 credits from one of the following concentrations:

General Sociology One course from each of the following pairs: SOC 311 or 432, 330 or 331, 350 or 351; and 12 hours from among all courses offered in sociology or anthropology not already taken to fulfill requirements.

Social Services Sociology SOC 380, 382, SOC (RS) 495; one course from among SOC 392, 394, 395, 480, 481; and 9 hours from among all courses offered in sociology and anthropology not already taken to fulfill requirements, including PSYCH 488.

Criminal Justice Sociology SOC 390, either 392 or 393, one course from among SOC 391, 395, HIST 496, POSC 434, 435; and 12 hours from among all courses offered in sociology and anthropology not already taken to fulfill requirements. SOC 495 is recommended.

Community and Population Studies Offered jointly with Rural Sociology (A) Twelve hours from among CAPL 411, SOC (RS) 359, 371, 401, 471; (B) Nine hours from among CAPL 415, 472, 473, CRD 357, CRD (AGEC) 411, 412, MTHSC 301, SOC 330, 331, 430, SOC (RS) 403, and one three-hour course not used to satisfy requirement A above. (RS 301 may be substituted for SOC 201 by Community and Rural Development majors.)

At least 9 of the total hours in the major must be 400-level sociology and/or rural sociology courses. Additional electives are added as needed to meet the minimum of 130 semester credits required for graduation.

MINOR CONCENTRATIONS

Students seeking the Bachelor of Arts degree may choose one of any number of minor concentrations available. The requirements for each minor are detailed below.

Accounting A minor concentration in Accounting requires ACCT 201, 202, 301, 302, and 6 additional credits in accounting courses numbered higher than 201.

American Studies A minor concentration in American Studies requires AMST 300, 400 and two courses from each of the following groups:

Group I ENGL 351, 353, 355, 357, 425, 455, HIST 306, 308, 314, 315, 400.
Group II ANTH 320, ECON 421, MUS 311, POSC 433, 453, 482, REL 310, RS 301, SOC 331, 460, SPCH 369.

English majors seeking a minor concentration in American Studies must select history courses from Group I; History majors seeking a minor concentration in American Studies must select English courses from Group I. Courses may be substituted for the courses in Groups I and II only with the approval of the American Studies adviser. In addition, the American Studies adviser must approve the minor programs of all students seeking the minor concentration in American Studies.

Biological Science A minor concentration in Biological Science requires 15 semester credits in the biological sciences numbered higher than 200.

Chemistry A minor concentration in Chemistry requires CH 101, 102, and 15 additional credits in chemistry, the courses to be selected in consultation with the Department of Chemistry.

Cluster Minor This minor concentration is designed to allow students a somewhat wider choice of course materials than is possible with the conventional subject-matter minor. The general requirement for the Cluster Minor is 15 semester credits in courses numbered higher than 300, except where noted differently, chosen according to one of the plans listed below. Courses within the student's major area may not be included in the Cluster Minor.

Group I Social Sciences—anthropology, economics, geography, history, political science, psychology, sociology.

Group II Administration—accounting, economics, finance, law, management, marketing.

Group III Life Sciences¹—biochemistry, botany, genetics, microbiology, zoology.

Group IV Physical Sciences¹—chemistry, geology, physics.

Communications A minor concentration in communications requires 18 credits distributed as follows:

General Communications Option ENGL 231, 312, and either SPCH 360 or 361, PHIL 102; 6 elective credits.

Advertising Option AGECE 351, ENGL 231 or 304, GC 104, PSYCH 330; 6 elective credits.

Commerce Option AGECE 351 or INED 496, ENGL 231 or 304, SPCH 360 or 361, MGT 301; 6 elective credits.

Politics Option ENGL 312 and either SPCH 360 or 361, POSC 341, 443; 6 elective credits.

Elective credits are approved by the Head of the Department of English or his/her representative.

Computer Science A minor in Computer Science requires CPSC 110 or 120, 130, 210, 230, and two additional computer science courses numbered 300 or higher.

Economics A minor concentration in Economics requires ECON 314, 407, and 9 additional credits from economics courses numbered 300 or higher.

English A minor concentration in English requires 15 semester credits in English above the sophomore level, arranged as follows:

Group I ENGL 411.

Group II Three credits from ENGL 405, 406, 407, 408, 409, 410, 412, 413, 414, 415, 416, 417, 418.

Group III Three credits from ENGL 422, 423, 424, 425.

Group IV Six additional credits above the sophomore level, including at least 3 credits from the 400-level.

Department certification of proficiency in composition is required. (See discussion under major concentration in English.)

¹No course in the 100 series is acceptable toward the Cluster Minor and not more than two courses in the 200 series are acceptable

Fine Arts The minor concentration in Fine Arts requires HUM 301², 302² and 15 semester credits from the following courses, of which at least 9 must be earned in courses numbered 300 or higher, and no more than 9 in any discipline selected from the following: Art and Architectural History (all courses); ENGL 345, 346, 357, 445, 446; HUM 305, 306, 309; LS 190; MUS 151, 152, 205, 206, 210, 251, 252, 301, 305, 306, 311, 315, 316, 351, 352, 362, 363, 365, 421, 422; SPCH 363, 369; THEA 279, 375, 376, 378; Visual Arts (all courses).

Geography The Geography minor consists of 18 hours. Required courses include GEOG 101 or 102 plus 15 hours of coursework at the 300-400 level. At least one 400-level course must be taken. Students may also apply PRTM 401, RS (SOC) 401 and 471 toward the minor requirements in Geography.

Geology A minor concentration in Geology requires GEOL 101 and 15 additional credits drawn from 300- and 400-level geology courses; at least one 400-level course must be included.

History A minor concentration in History requires 15 semester credits in history at the 300 and 400 level. Three credits at the 400-level must be included.

International Studies A minor concentration in International Studies requires the global perspectives core course, IS 201 and 15 additional credits at the 300-400 level as indicated below, and a minimum of 3 hours from each group as follows:

- Group I Economics, Political Science, and Sociology—ECON 404, 410, 412, POSC 361, 371, 373, 379, 462, 463, 465, 475, 476, SOC 311, 433.
- Group II Geography and History—GEOG 301, 302, 303, 401, HIST 330, 333, 341, 342, 382, 384, 386, 440, 492, 494.
- Group III Languages (French, German, and Spanish)—FR 305, 307, 316, 411, GER 305, 307, 411, 413, SPAN 305, 307, 308, 411, 414, 435, and study abroad courses.

Marketing A minor concentration in Marketing requires MKT 301; either HIST 306, POSC 443, PSYCH 364, or SOC 330; and 12 additional hours drawn from 400-level marketing courses.

Mathematical Sciences A minor concentration in Mathematical Sciences requires MTHSC 208, 301, and 9 additional credits in mathematical sciences courses numbered 300 or higher.

Modern Languages A minor concentration in Modern Languages requires 15 semester credits in one modern language from courses on the 300 and 400 levels, including at least one course on the 400 level. In addition, a minor concentration in French requires FR 205.

Music¹ A minor concentration in Music requires MUS 151, 152, 205, 206, two credits in ensemble (MUS 361, 362, 363, 365), and 11 additional credits from these courses: MUS 210, 251, 252, 301, 305, 306, 311, 315, 316, 351, 352, 421, 422. Two additional ensemble credits may be included.

¹Housed in the Department of Performing Arts

²Students transferring from the College of Architecture may substitute CADS 151-152 for HUM 301-302

Philosophy A minor concentration in Philosophy requires 18 semester credits in philosophy. These 18 credits may include one 100-level philosophy course (PHIL 101, 102, or 103). At least one 3-credit course at the 400-level must be included. REL 309 may be counted toward the minor.

Physics A minor concentration in Physics requires PHYS 122 and 15 additional semester credits in physics, including PHYS 221, 222.

Political Science A minor concentration in Political Science requires POSC 101, 201, and 15 additional semester credits selected from at least three of the fields of political science. At least one 400-level course must be included. No more than 3 hours credit from POSC 310, 311, or 312 may be applied to the requirements for a Political Science minor.

Psychology A minor concentration in Psychology requires PSYCH 201, and 205 or 210 (except for Sociology majors) and 15 semester credits from 300- and 400-level psychology courses. At least one 400-level course must be included.

Religion A minor concentration in Religion requires REL 101 plus 15 credits in religion courses numbered above 300, including at least one course numbered above 400. PHIL 303 and SOC 432 may be included in the minor, provided that they are not counted towards meeting requirements for a major or minors in those fields.

Science and Technology in Society A minor in Science and Technology in Society requires STS 300 plus 15 additional hours, at least six of which must be on the 400 level. No course that is used to meet the requirements of a disciplinary major may also be used to meet the Science and Technology in Society minor requirements. See adviser for list of approved courses.

Sociology A minor concentration in Sociology requires SOC 201 and 15 credits from sociology and rural sociology courses numbered 300 or higher. At least one 400-level course must be included.

Spanish-American Area Studies A minor concentration in Spanish-American Area Studies requires the equivalent of SPAN 202, plus 15 semester credits distributed as follows: 6 credits from HIST 340, 341, 342, 440; 6 credits from SPAN 305, 308, 311, 411; 3 credits from AGRIC 301, 401, ECON 410, POSC 475.

Speech¹ A minor concentration in Speech requires 15 semester credits taken from among the following courses: ENGL 491, 492, SPCH 162, 250, 260, 268, 360, 361, 363, 364, 365, 366, 369.

Theatre¹ The minor concentration in Theatre requires THEA 378 and 15 additional semester credits arranged as follows:

Group I Dramatic Literature—At least 3 credits from these courses:
ENGL 404, 410, 411, 430.

Group II Production and Playwriting—9 credits from these courses:
ENGL 347, 447; THEA 375, 376, 377, 475, 476, 477.

Group III Electives—3 additional credits from the 400-level courses listed above.

¹Housed in the Department of Performing Arts.

Women's Studies A minor concentration in Women's Studies requires 15 semester credit hours on the 300- and 400-level, distributed as follows:

Group I 6 credits: WS 301 and 498.

Group II 6 credits chosen from core courses: ENGL 380, 436, HIST 318, PSYCH 308, SOC 461, and any additional courses approved for Group II.

Group III The final 3 credits may be earned by taking any approved Women's Studies minor course.

Courses selected in Groups II and III must represent at least two disciplines. No course that is used to meet the requirements of a disciplinary major may also be used to meet the Women's Studies minor requirements. The courses for this minor are to be scheduled in consultation with the appropriate advisers. The Women's Studies adviser will provide all affected advisers with a list of approved courses, prior to preregistration.

Writing A minor concentration in writing requires 15 credits as follows:

Business and Technical Option AGECE 351 or GC 104, CPSC 120, ENGL 304 or 314, 392, 490.

Journalism Option ENGL 231, 333, 334, 335; one of the following electives: AGECE 351, CPSC 120, GC 104, ENGL 217, 304, 312, 314, INED 496, PHIL 102; SPCH 250, 260; any course approved by the Head of the English Department.

Writing Pedagogy Option ENGL 312, 400, 401, 485; elective (3 credits), any 300- or 400-level writing course offered by the English Department.

Creative Writing Options

Drama ENGL 347, 447 (6 credits), 430; one of the following electives: ENGL 312, 410, 411; THEA 378.

Fiction ENGL 345, 445 (6 credits), 432; one of the following electives: ENGL 312, 418, 425, 426.

Poetry ENGL 346, 446 (6 credits), 431; one of the following electives: ENGL 312, 413, 416, 417.

COURSES NOT APPROVED FOR GRADUATION CREDIT IN THE COLLEGE OF LIBERAL ARTS

Students majoring in the College of Liberal Arts are not permitted to use ENGL 100, MTHSC 115, 116, 215, 216 as credit toward the number of hours needed for graduation.

COLLEGE OF NURSING

Clemson University College of Nursing provides baccalaureate and master's degree programs to prepare for careers in nursing. Opportunities within the College of Nursing and elsewhere in the University combine to provide a setting which enables students to fulfill a wide range of educational objectives. Each student enrolled in nursing is encouraged to recognize these opportunities and partake of them.

The four-year program leading to the Bachelor of Science in Nursing is designed to prepare students for the practice of professional nursing in a variety of settings, such as hospitals, industry, clinics, and public health agencies. This curriculum provides an unlimited opportunity for men and women to attain sound preparation for professional nursing and a foundation for graduate study in nursing. During the first two years, emphasis is upon liberal arts and basic science courses arranged sequentially to provide a foundation for the nursing major. In junior and senior years the emphasis is upon the study of nursing. However, throughout the entire program, students are encouraged to enroll in courses outside their majors which can be taken simultaneously with the study of nursing. Nursing courses are integrated through all years of the curriculum.

Clinical nursing experiences, under the guidance of the College of Nursing faculty, take place with clients in multiple hospitals, clinics, and other health agencies. These community resources enable students of nursing to enjoy a variety of clinical facilities and assist faculty to provide quality clinical instruction.

ENTRANCE REQUIREMENTS

To facilitate admission of students who can achieve at an appropriate level in the program, admission is selective. Consideration is given to performance in secondary school and on the College Board Examination (SAT). Those seeking admission are advised to apply to the University early in the fall of the senior year in high school.

OTHER REQUIREMENTS

All students enrolled in the College of Nursing are required to carry throughout the period of clinical laboratory assignments a current and valid student nurse's professional liability insurance policy with minimum limits of liability of \$200,000 per occurrence and \$600,000 in aggregate and provide documentation thereof to the Dean of the College of Nursing. No student may participate in clinical learning activities without this insurance coverage.

BACHELOR OF SCIENCE IN NURSING**FRESHMAN YEAR**

First Semester		Second Semester	
BIOL 103 General Biology I	.3	BIOL 104 General Biology II	3
CH 101 General Chemistry	.4	CH 102 General Chemistry	4
ENGL 101 Composition I	.3	ENGL 102 Composition II	3
NURS 130 Introduction to Nursing	1	NURS 131 Intro. to Communication for Health Professionals	.1
PSYCH 201 Introduction to Psychology	.3	SOC 201 Introduction to Sociology	3
Mathematics Requirement ³	.3	Computer Technology Requirement ¹	.3
	<u>17</u>		<u>17</u>

SOPHOMORE YEAR

NURS 210 Health Assessment	.3	EXST 301 Introductory Statistics	3
NURS 230 Professionalism in Nursing I	2	or MTHSC 203 Elem. Stat. Inference	3
MICRO 205 Introductory Microbiology	.4	NURS 211 Fund. Principles of Nursing	4
ZOOL 222 Human Anatomy	4	PSYCH 340 Life Span Development Psych	3
Literature Requirement ²	.3	SOC 311 The Family	3
	<u>16</u>	ZOOL 223 Human Physiology	4
			<u>17</u>

JUNIOR YEAR

NURS 301 Nursing Care of the Childbearing Family	.4	NURS 303 Adult Nursing I	7
NURS 302 Nursing Care of Children	.4	NURS 304 Pathophysiology for Health Care Professionals	3
NURS 315 The Developing Family in the Community	4	NURS 316 Adult Nurs. in the Community	4
NURS 330 Professionalism in Nursing II	2	Humanities Requirement ⁴	3
NUTR 451 Human Nutrition	.3		<u>17</u>
	<u>17</u>		

SENIOR YEAR

NURS 401 Mental Health Nursing	4	NURS 403 Adult Nursing II	6
NURS 402 Long-Term Nursing Care	.3	NURS 404 Nursing Management	3
NURS 415 Community Health Nursing	.3	NURS 430 Professionalism in Nursing III	2
Public Speaking Requirement ³	3	Elective	6
Elective	.4		<u>17</u>
	<u>17</u>		

135 Total Semester Hours

¹See adviser²ENGL 202, 203, 204, 205, 206, 207, 208, 209³See page 52.⁴See page 53.**Notes:**

1. A minimum of C is required in nursing courses numbered 200 and above. Students may repeat a nursing course one time only.

2. A minimum of C is required in the following science courses for progression to junior year: BIOL 103, 104, CH 101, 102, MICRO 205, ZOOL 222, 223.

3. A minimum grade-point ratio of 2.0 is required for registration in nursing courses numbered 300 and above.

MINOR CONCENTRATION

Health Science A minor in Health Science requires HLTH 298 plus 12 additional credits drawn from the 300- and 400-level health courses; at least one 400-level course must be included. Select from the following: HLTH 301, 310, 320, 401, 402, 410, 498.

COLLEGE OF SCIENCES

The College of Sciences, attuned to the times and its needs, offers ten major curricula leading to the degree of Bachelor of Science. These are Biochemistry, Biological Sciences, Chemistry, Computer Information Systems, Computer Science, Geology, Mathematical Sciences, Medical Technology, Microbiology, and Physics.

In addition, the Bachelor of Arts degree is offered with a major emphasis in Biological Sciences, Chemistry, Geology, Mathematical Sciences, and Physics.

Not only are the departments in the College of Sciences concerned with their own programs, but they work closely with the other academic departments in the University. This interweaving of the physical, mathematical and biological sciences with other disciplines, such as economics, engineering, management and others allows students great flexibility and responsibility in designing their own programs.

BACHELOR OF ARTS CURRICULA

The curricula leading to the Bachelor of Arts degree are designed to meet the needs of those students who desire a broad general education. The first two years are spent in introductory work in several areas in order to give the student breadth of view. This background enables the student to select intelligently the major and minor fields of concentration. The major areas in the College of Sciences are Biological Sciences, Chemistry, Geology, Mathematical Sciences, and Physics.

A student has a large degree of flexibility and responsibility in designing the minor area from any departments in the University. All minors listed and described on pages 140-144 under the College of Liberal Arts are approved for this program as well as any of the natural sciences and mathematical sciences. The courses for these minors are to be selected in consultation with the appropriate department. The minor fields are as follows:

Accounting	Geography	Political Science
American Studies	Geology	Psychology
Biochemistry	Health Science	Religion
Biological Sciences	History	Science and Technology in Society
Chemistry	International Studies	Sociology
Cluster Minor	Marketing	Spanish-American Area Studies
Communications	Mathematical Sciences	Speech
Computer Science	Microbiology	Theatre
Economics	Modern Languages	Women's Studies
English	Music	Wood Utilization
Fine Arts	Philosophy	Writing
Forest Management	Physics	

To fulfill requirements for a major concentration, a student takes 24 semester hours credit from courses above the sophomore level including or in addition to certain courses specified by the major department;

the minor concentration requires 15 credits from courses above the sophomore level. In some major and minor disciplines, certain prescribed courses at the sophomore level are counted toward the 24 and 15 credit-hour requirements.

MAJOR FIELDS OF CONCENTRATION

BIOLOGICAL SCIENCES

The Bachelor of Arts in Biological Sciences provides a strong foundation in biology and is ideal for students desiring a liberal education emphasizing an interdisciplinary approach to a thorough understanding of the life sciences.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 110 Principles of Biology I ¹	5	BIOL 111 Principles of Biology II ¹	5
CH 101 General Chemistry	4	CH 102 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
Foreign Language Requirement ²	4	Foreign Language Requirement ²	4
	<u>16</u>		<u>16</u>

SOPHOMORE YEAR

BIOSC 202 Animal Diversity ³	4	BIOSC 201 Plant Diversity ³	4
or BIOSC 201 Plant Diversity	4	or BIOSC 202 Animal Diversity	4
HIST 172 Western Civilization	3	HIST 173 Western Civilization	3
MTHSC 106 Calculus of One Variable I	4	MTHSC 108 Calculus of One Variable II	4
Foreign Language Requirement ²	3	or MTHSC 301 Stat. Theory and Meth. I	3
Literature Requirement ⁴	3	Foreign Language Requirement ²	3
	<u>17</u>	Literature Requirement ⁴	<u>3</u>
			<u>16-17</u>

JUNIOR YEAR

BIOCH 210 Elementary Biochemistry	4	ENGL 314 Technical Writing	3
PHYS 207 General Physics I	4	or SPCH 250 Public Speaking	3
Major ⁵	4	PHIL 325 Philosophy of Science	3
Minor ⁶	3	PHYS 208 General Physics II	4
Elective	3	Major ⁵	4
	<u>18</u>	Minor ⁶	<u>3</u>
			<u>17</u>

SENIOR YEAR

Major ⁵	4	Major ⁵	4
Minor ⁶	6	Minor ⁶	3
Elective	6	Elective	9
	<u>16</u>		<u>16</u>

132 Total Semester Hours

¹BIOL 110 and 111 are strongly recommended. However, BIOL 103/105 may substitute for BIOL 110 and BIOL 104/106 may substitute for BIOL 111; the remaining 1-2 hours required must be satisfied by completing 1-2 extra hours in major elective courses.

²Four semesters of the same language are required.

³BIOSC 201, 202 count toward the required 24 hours of the Biological Science major.

⁴ENGL 202, 203, 204, 205, 206, 207, 208, 209.

⁵At least one course must be taken from each of 4 course areas. (1) Genetics and Evolution, (2) Ecology and Behavior, (3) Development and Cell Biology, and (4) Physiology.

⁶Minors, in addition to those listed under Bachelor of Arts Curricula in the College of Sciences, may be arranged in consultation with a departmental adviser.

CHEMISTRY

For the Bachelor of Arts degree, Chemistry requires 130 semester hours.

FRESHMAN YEAR

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 112 General Chemistry ¹	4
CH 141 Chemistry Orientation	1	ENGL 102 Composition II	3
ENGL 101 Composition I	3	MTHSC 108 Calculus of One Variable II	4
MTHSC 106 Calculus of One Variable I	4	Modern Language ⁴	4
Modern Language ⁴	4		15
	16		

SOPHOMORE YEAR

CH 223 Organic Chemistry ³	3	CH 224 Organic Chemistry ³	3
CH 225 Organic Chemistry Lab. ³	2	CH 226 Organic Chemistry Lab. ³	2
MTHSC 206 Cal. of Sev. Var.	4	HIST 172 Western Civilization	3
PHYS 122 Phys. with Cal. I	3	PHYS 221 Phys. with Cal. II	3
Literature Requirement ²	3	Modern Language ⁴	3
Modern Language ⁴	3	Elective	3
	18		17

JUNIOR YEAR

CH 313 Quantitative Analysis	3	CH 331 Physical Chemistry	3
CH 317 Quantitative Analysis Lab.	1	ENGL 314 Technical Writing	3
HIST 173 Western Civilization	3	or SPCH 250 Public Speaking	3
Humanities Requirement	3	Minor	6
Minor	3	Elective	5
Elective	3		17
	16		

SENIOR YEAR

CH 332 Physical Chemistry	3	Chemistry Elective	4
Minor	3	Minor	3
Elective	9	Elective	9
	15		16

130 Total Semester Hours

¹Students are encouraged to add as an elective CH 205.

²ENGL 202, 203, 204, 205, 206, 207, 208, 209

³CH 223, 224, 225, 226 will count toward the 24 hours of the Chemistry major

⁴Four semesters of the same language.

GEOLOGY

For the Bachelor of Arts degree, Geology requires 128 semester hours.

FRESHMAN YEAR

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 102 or 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
GEOL 101 Physical Geology	3	GEOL 102 Historical Geology	3
GEOL 103 Physical Geology Lab.	1	GEOL 104 Historical Geology Lab.	1
MTHSC 102 Introduction to Math. Analysis	3	MTHSC 101 Finite Probability	3
or MTHSC 106 Calculus of One Var. I	4	or MTHSC 108 Calculus of One Var. II	4
	14-15	or MTHSC 207 Multivariable Calculus	3
		Elective	3
			17-18

SOPHOMORE YEAR

HIST 172 Western Civilization	3	HIST 173 Western Civilization	3
Literature Requirement ¹	3	Humanities Requirement	3
Modern Language ²	4	Modern Language ²	4
Elective	6	Science Requirement ³	3
	16	Elective	3
			16

JUNIOR YEAR

ENGL 314 Technical Writing	3	GEOL 309 Petrology	3
GEOL 306 Mineralogy	3	Geology Elective ⁴	3
Geology Elective ⁴	3	Minor	3
Minor	3	Modern Language ²	3
Modern Language ²	3	Elective	5
Elective	2		17
	17		

SENIOR YEAR

GEOL 402 Structural Geology	3	GEOL 404 Economic Geology	3
Geology Elective ⁴	3	Geology Elective ⁴	3
Minor	6	Minor	3
Elective	3	Elective	7
	15		16

128 Total Semester Hours

¹ENGL 202, 203, 204, 205, 206, 207, 208, 209.

²Two years of the same language are required.

³Select from BIOL 103, CPSC 110, 120, EXST 301, PHYS 122, 207.

⁴Select from any 300- or 400-level geology course not required in the curriculum.

MATHEMATICAL SCIENCES

For a major concentration a recommended program of study is shown below, with 130 semester hours required for graduation.

FRESHMAN YEAR

First Semester		Second Semester	
CPSC 110 Elem. Comp. Programming	3	ECON 200 Economic Concepts	3
ENGL 101 Composition I	3	or ECON 211 Principles of Economics	3
HIST 172 Western Civilization	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I	4	MTHSC 108 Calculus of One Variable II	4
Foreign Language ¹	4	MTHSC 129 Prob. Solving in Disc. Math	3
	17	Foreign Language ¹	4
			17

SOPHOMORE YEAR

MTHSC 206 Cal. of Several Var.	4	MTHSC 208 Intro. to Ord. Diff. Equa.	4
MTHSC 250 Intro. to Mathematical Sciences	1	MTHSC 311 Linear Algebra	3
Foreign Language ¹	3	Foreign Language ¹	3
Literature Requirement ²	3	Literature Requirement ²	3
Natural Science Requirement ³	4	Natural Science Requirement ³	4
	15		17

JUNIOR YEAR

CAAH 310 Evolution of Visual Arts	3	HIST 173 Western Civilization	3
or MUS 210 Music Appreciation	3	MTHSC 401 Statistical Methodology	3
ENGL 314 Technical Writing	3	MTHSC 412 Intro. to Mod. Alg.	3
or SPCH 250 Public Speaking	3	Minor	3
MTHSC 400 Theory of Probability	3	Social Science Requirement ³	3
Minor	3	Elective	2
Social Science Requirement ³	3		17
Elective	2		
	17		

SENIOR YEAR

MTHSC 440 Linear Programming	3	MTHSC 454 Adv. Calculus II	3
or MTHSC 450 Intro. to Math. Models	3	or MTHSC 464 Math. Analysis II	3
MTHSC 453 Advanced Calculus I	3	Humanities Requirement ³	3
or MTHSC 463 Math. Analysis I	3	Mathematical Sciences Requirement ⁴	3
Minor	6	Minor	3
Elective	3	Elective ³	3
	15		15

130 Total Semester Hours

¹Four semesters of the same language.

²ENGL 202, 203, 204, 205, 206, 207, 208, 209.

³Must be approved by adviser.

⁴Select from 300- and 400-level mathematical science courses with approval of adviser.

Notes:

1. For graduation, a candidate for the BA degree in Mathematical Sciences will be required to have a 2.0 or higher cumulative grade-point ratio in all required courses taught by the Mathematical Sciences Department including approved mathematical sciences electives and option courses.

2. A grade of C or better must be earned in all prerequisite courses before enrolling in the next mathematical science course.

PHYSICS

For a major concentration a recommended program of study is shown below, with 129 semester hours required for graduation.

The BA in Physics program is ideal for students interested in acquiring a broad-based liberal education that includes a strong and solid understanding of science.

FRESHMAN YEAR

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
HIST 172 Western Civilization ¹	3	HIST 173 Western Civilization ¹	3
MTHSC 106 Calculus of One Variable I	4	MTHSC 108 Calculus of One Variable II	4
PHYS 101 Current Topics in Modern Physics	1	PHYS 122 Phys. with Cal. I	3
	15	PHYS 124 Physics Lab. I	1
			18

SOPHOMORE YEAR

MTHSC 206 Calculus of Sev. Var.	4	MTHSC 208 Intro. to Ord. Diff. Equa.	4
PHYS 221 Physics with Cal. II	3	PHYS 222 Physics with Cal. III	3
PHYS 223 Physics Lab. II	1	PHYS 224 Physics Lab. III	1
Literature Requirement ²	3	Literature Requirement ²	3
Modern Language ¹	4	Modern Language ¹	4
Elective	1		15
	16		

JUNIOR YEAR

ECE (PHYS) 340 Electromagnetics I	2	ECE (PHYS) 341 Electromagnetics II	2
PHYS 321 Mechanics I	3	PHYS 322 Mechanics II	3
English (as approved) ³	3	Humanities Requirement ⁴	3
Humanities Requirement ⁴	3	Minor	3
Minor	3	Modern Language ¹	3
Modern Language ¹	3	Elective	3
	17		17

SENIOR YEAR

PHYS 455 Quantum Physics I	3	Minor	3
Minor	6	Physics (as approved)	3
Physics (as approved)	4	Social Science Requirement ⁴	3
Social Science Requirement ⁴	3	Elective	6
	16		15

129 Total Semester Hours

¹Modern Language may be taken before history.

²ENGL 202, 203, 204, 205, 206, 207, 208, 209.

³Select from approved English courses in advanced writing or public speaking

⁴See page 53

BACHELOR OF SCIENCE CURRICULA**BIOCHEMISTRY**

Biochemistry is the study of the molecular basis of life. In order to comprehend current biochemical information and to make future contributions to our molecular understanding of life processes, the student must obtain a broad background in biology and a firm foundation in chemistry, mathematics, and physics; the biochemistry curriculum is built upon this concept.

The program provides an excellent educational background for professional school (e.g., medicine, dentistry, or veterinary medicine) and graduate school in biochemistry, molecular biology, or another biological science discipline.

The graduate will find employment opportunities in the research and service programs of universities, medical schools, hospitals, research institutes, and industrial and government laboratories.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 110 Principles of Biology I	5	BIOL 111 Principles of Biology II	5
CH 101 General Chemistry	4	CH 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I	4	MTHSC 108 Calculus of One Variable II	4
	<u>16</u>		<u>16</u>

SOPHOMORE YEAR

CH 223 Organic Chemistry	3	BIOCH 301 General Biochemistry	3
CH 227 Organic Chemistry Lab. ¹	1	CH 224 Organic Chemistry	3
MICRO 305 General Microbiology	4	CH 228 Organic Chemistry Lab. I	1
MTHSC 206 Calculus of Sev. Var.	4	PHYS 221 Phys. with Cal. II	3
PHYS 122 Phys. with Cal. I	3	PHYS 223 Physics Lab. II	1
Literature Requirement ²	3	Literature Requirement ²	3
	<u>18</u>	Approved Elective ³	3
			<u>17</u>

JUNIOR YEAR

BIOCH 425 General Biochemistry Lab	1	BIOCH 426 General Biochemistry Lab	1
BIOCH 431 Phys. Approach to Bioch.	3	BIOCH 432 Biochemistry of Metabolism	3
CH 331 Physical Chemistry	3	CH 332 Physical Chemistry	3
CH 339 Physical Chemistry Lab.	1	CH 340 Physical Chemistry Lab.	1
PHYS 222 Phys. with Cal. III	3	Science Requirement ⁴	3
Science Requirement ⁴	3	Approved Elective ³	6
Elective	3		<u>17</u>
	<u>17</u>		

SENIOR YEAR

BIOCH 491 Special Problems in Bioch. or Science Requirement ⁴	3	BIOCH 491 Special Problems in Bioch. or Science Requirement ⁴	3
CH 313 Quantitative Analysis	3	Approved Elective ³	6
CH 317 Quantitative Anal. Lab.	1	Elective	7
ENGL 314 Technical Writing	3		<u>16</u>
or SPCH 250 Public Speaking	3		
Approved Elective ³	7		
	<u>17</u>		

134 Total Semester Hours

¹CH 225 may be substituted for CH 227, and CH 226 may substitute for CH 228. In both cases, the additional hour of credit counts toward a science elective or can replace PHYS 223.

²ENGL 202, 203, 204, 205, 206, 207, 208, 209.

³At least 18 hours must be elected from the humanities and/or social sciences. Of these, a minimum of 6 hours must be in the social sciences to be selected from anthropology, economics, geography, history, political science, psychology, or sociology. A one-year sequence from the following is strongly recommended: FR 101, 102, GER 101, 102, or RUSS 101, 102.

⁴Select Approved Electives from botany, chemistry, computer science, genetics, mathematics, microbiology, physics, plant pathology, or zoology, or as approved by the adviser in consultation with the Biochemistry faculty.

BIOLOGICAL SCIENCES

Biology encompasses the broad spectrum of the modern life sciences, including the study of all aspects of life from the structure and function of the whole organism down to the subcellular levels and up through the interactions of organisms to the integrated existence of life on the entire planet. Descriptive, structural, functional, and evolutionary questions are explored through the hierarchy of the organization of life. Applications of current advances to the health and well-being of man and his society, to nature and the continuation of earth as a balanced ecosystem, and to an appreciation of the place of natural science in our cultural heritage receive emphasis.

Majors in Biological Sciences receive classroom, laboratory, and field training in biology with an emphasis on chemistry, mathematics, and physics as necessary tools. The Bachelor of Science in Biological Sciences curriculum prepares students for graduate study in any of the life science areas (such as agricultural sciences, biochemistry, botany, cell and molecular biology, conservation, ecology and environmental science, entomology, forestry, genetics, industrial and regulatory biology, microbiology, morphology, physiology, wildlife biology, and zoology, among others), for the health professions (medicine, dentistry, etc.), veterinary medicine, and for science teaching.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 110 Principles of Biology I ¹	5	BIOL 111 Principles of Biology II ¹	5
CH 101 General Chemistry	4	CH 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I	4	MTHSC 108 Calculus of One Variable II	4
	<u>16</u>		<u>16</u>

SOPHOMORE YEAR

BIOSC 202 Animal Diversity	4	BIOSC 201 Plant Diversity	4
or BIOSC 201 Plant Diversity	4	or BIOSC 202 Animal Diversity	4
CH 223 Organic Chemistry	3	CH 224 Organic Chemistry ⁴	3
CH 227 Organic Chemistry Lab.	1	PHIL 325 Philosophy of Science	3
Literature Requirement ²	3	Social Science Requirement ⁵	3
Approved Elective ³	3	Approved Elective ³	3
Elective	3		<u>16</u>
	<u>17</u>		

JUNIOR YEAR

BIOCH 301 General Biochemistry	3	ENGL 314 Technical Writing	3
BIOCH 302 Molecular Biology Lab. ⁴	1	or SPCH 250 Public Speaking	3
PHYS 207 General Physics I	4	PHYS 208 General Physics II	4
or PHYS 122 Phys. with Cal. I	3	or PHYS 221 Physics with Cal. II	3
and PHYS 124 Physics Lab I ⁶	1	and PHYS 223 Physics Lab. II	1
Major ⁷	6	Major ⁷	7
Social Science Requirement ⁵	3	Elective	3
	<u>17</u>		<u>17</u>

SENIOR YEAR

Major ⁷	12	Major ⁷	12
Elective	6	Elective	6
	<u>18</u>		<u>18</u>

135 Total Semester Hours

¹BIOL 110 and 111 are strongly recommended. However, BIOL 103/105 may substitute for BIOL 110 and BIOL 104/106 may substitute for BIOL 111, the remaining 1-2 hours required must be satisfied by completing 1-2 extra hours in major elective courses.

²Select from sophomore literature courses (200-level only).

³Approved electives are selected in consultation with an adviser to complement the student's curriculum.

⁴CH 228 Organic Chemistry Laboratory may be substituted for BIOCH 302.

⁵Select from course offerings in social sciences (geography, economics, history, political science, psychology, and sociology).

⁶Physics with calculus is a three semester sequence. Students selecting this option may wish to take PHYS 222, 224 in the senior year to complete the sequence.

⁷At least one course must be taken from each of 4 course areas: (1) Genetics and Evolution, (2) Ecology and Behavior, (3) Development and Cell Biology, and (4) Physiology. The remaining courses may be selected from among the departmental course offerings at the 300-level or above.

CHEMISTRY

Chemistry, an experimental discipline based on observation guided by molecular theory, is of fundamental importance in much of modern science and technology. Its molecular concepts form the basis for ideas about complex material behavior. Due to the fundamental nature and extensive application of chemistry, an unusually large variety of challenging opportunities to contribute in the science-oriented community are open to the student whose education is built around the principles of this discipline.

The curriculum, through the career requirement options and the large number of electives, provides each student an opportunity to select a coherent program of study beyond the basic courses suited to his or her needs. Career requirement options are provided for students anticipating graduate study in chemistry or related fields; employment following the BS degree in laboratory, production, technical sales or management positions; professional studies (e.g., medicine); chemical physics; geochemistry; and employment in fields requiring extensive preparation in courses other than sciences (e.g., patent law and technical writing). Significant features of the curriculum are the student's extensive participation in experimental work and the opportunity to take part in a research investigation during the junior and senior years.

FRESHMAN YEAR

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 112 General Chemistry	4
CH 141 Chemistry Orientation	1	CH 205 Intro. to Inorganic Chemistry	2
CPSC 110 Elem. Computer Prog.	3	ENGL 102 Composition II	3
ENGL 101 Composition I	3	MTHSC 108 Calculus of One Variable II	4
MTHSC 106 Calculus of One Variable I	4	PHYS 122 Phys. with Cal. I	3
	15		16

SOPHOMORE YEAR

CH 223 Organic Chemistry	3	CH 224 Organic Chemistry	3
CH 225 Organic Chemistry Lab.	2	CH 226 Organic Chemistry Lab.	2
MTHSC 206 Calculus of Sev. Var.	4	MTHSC 208 Intro. to Ord. Diff. Equa.	4
PHYS 221 Phys. with Cal. II	3	PHYS 222 Phys. with Cal. III	3
PHYS 223 Physics Lab. II	1	PHYS 224 Physics Lab. III	1
Foreign Language ¹	4	Foreign Language ¹	4
	17		17

JUNIOR YEAR

CH 313 Quantitative Analysis	3	CH 332 Physical Chemistry	3
CH 315 Quantitative Anal. Lab.	2	CH 340 Physical Chemistry Lab.	1
CH 331 Physical Chemistry	3	CH 411 Instrumental Analysis	4
CH 339 Physical Chemistry Lab.	1	ENGL 314 Technical Writing	3
Literature Requirement ²	3	Elective ³	5
Elective ³	3		16
	15		

SENIOR YEAR

CH 402 Inorganic Chemistry	3	Chemistry Elective ⁴	4
CH 443 Research Problems	3	Elective	13
Chemistry Elective ⁴	3		17
Elective ³	8		
	17		

130 Total Semester Hours

¹One year of German, French, or Russian.

²ENGL 202, 203, 204, 205, 206, 207, 208, 209.

³At least 3 hours must be in humanities and 6 hours in social sciences.

⁴CH 421 and 435 are recommended for students qualified for graduate studies.

COMPUTER INFORMATION SYSTEMS

The Computer Information Systems degree program is oriented toward computer applications in management-related problems. The program emphasizes functional areas of management including accounting, production, marketing and finance, and the applications of computers in these areas. The curriculum is designed to prepare students for careers in areas such as systems design and analysis, applications programming, database administration and information retrieval as well as for continued study toward an advanced degree.

FRESHMAN YEAR

First Semester

CPSC 101 Computer Science I	4
ENGL 101 Composition I	3
MTHSC 119 Intro. to Discrete Math	3
Humanities/Social Science Requirement ¹	3
Natural Science Requirement ²	4
	17

Second Semester

CPSC 102 Computer Science II	4
ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I	4
Humanities/Social Science Requirement ¹	3
Natural Science Requirement ²	4
	18

SOPHOMORE YEAR

CPSC 231 Computer Science III	4
ECON 211 Principles of Economics	3
MTHSC 108 Calculus of One Variable II	4
Literature Requirement ³	3
Natural Science Requirement ²	3
	17

ACCT 203 Financial Accounting	3
CPSC 241 Computer Science IV	4
MGT 301 Principles of Management	3
MTHSC 210 Applied Matrix Algebra	3
or MTHSC 311 Linear Algebra	3
Humanities/Social Science Requirement ¹	3
	16

JUNIOR YEAR

ACCT 307 Managerial Accounting	3
CPSC 360 Periph. and File Design	3
CPSC 361 Data Mgt. Systems Lab	1
MKT 301 Principles of Marketing	3
MTHSC 301 Stat. Theory and Meth. I	3
SPCH 250 Public Speaking	3
	16

CPSC 331 Computer Systems Lab	1
CPSC 332 Computer Systems ⁴	3
CPSC 372 Intro. to Software Dev	3
ENGL 304 Business Writing	3
or ENGL 314 Technical Writing	3
FIN 306 Corporation Finance	3
Elective	3
	16

SENIOR YEAR

CPSC 371 Systems Analysis	3
CPSC 462 Database Management Systems	3
CPSC 491 Senior Seminar in Comp. Sci	1
MGT 400 Mgt. of Org. Behavior	3
or MGT 416 Mgt. of Hum. Res.	3
MGT 402 Prod. and Op. Mgt. I	3
Elective	3
	16

CPSC 463 Online Systems	3
Commerce and Industry Requirement ⁶	3
Computer Science Requirement ⁵	3
Humanities/Social Science Requirement ¹	3
Elective	4
	16

132 Total Semester Hours

¹Select to satisfy Social Sciences section, General Education Requirements, page 53.

²Must include one of the following sequences: BIOL 103, 104, 105, 106, CH 101, 102 or 112, PHYS 122, 124, 221, 223, PHYS 207, 208.

³ENGL 202, 203, 204, 205, 206, 207, 208, 209.

⁴For a stronger emphasis on operating systems, CPSC 422 may be substituted for CPSC 332.

⁵Select from CPSC 330, 350, or any 400-level computer science course except CPSC 422.

⁶Select from ACCT 410; MASC 413, 414; MGT 404, 408; MKT 432.

Notes:

1 For graduation, a candidate for the BS degree in Computer Information Systems must have earned a grade of C or better in each computer science course applied to the degree.

2 A grade of C or better must be earned in all prerequisite courses before enrolling in the next computer science course.

COMPUTER SCIENCE

The Computer Science degree program is oriented toward design, implementation, and application of computer software systems to solve information processing problems in general. An "applications emphasis" in an area outside of computer science allows the program to be tailored to the needs and interests of individual students. This curriculum is more technically oriented than the computer information systems curriculum, and it prepares a student for employment in the computer software field or for continued study toward an advanced degree in computer science.

This program has been accredited by the Computer Science Accreditation Commission of the Computing Sciences Accreditation Board.

FRESHMAN YEAR

First Semester		Second Semester	
CPSC 101 Computer Science I	4	CPSC 102 Computer Science II	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 119 Intro. to Discrete Math	3	MTHSC 106 Calculus of One Variable I	4
Humanities/Social Science Requirement ¹	3	Humanities/Social Science Requirement ¹	3
Natural Science Requirement ²	4	Natural Science Requirement ²	3
	<u>17</u>		<u>17</u>

SOPHOMORE YEAR

CPSC 231 Computer Science III	4	CPSC 241 Computer Science IV	4
MTHSC 108 Calculus of One Variable II	4	ECE 201 Logic and Computing Devices	3
PHYS 122 Physics with Calculus I	3	MTHSC 311 Linear Algebra	3
PHYS 124 Physics Lab. I	1	PHYS 221 Physics with Calculus II	3
Literature Requirement ³	3	PHYS 223 Physics Lab. II	1
Elective	3	Humanities/Social Science Requirement ¹	3
	<u>18</u>		<u>17</u>

JUNIOR YEAR

CPSC 330 Computer Systems Org.	4	CPSC 331 Computer Systems Lab.	1
CPSC 360 Peripherals and File Design	3	CPSC 350 Foundations of Computer Science	3
CPSC 361 Data Mgt. Systems Lab.	1	CPSC 372 Intro. to Software Dev.	3
MTHSC 301 Stat. Theory and Meth. I	3	ENGL 314 Technical Writing	3
SPCH 250 Public Speaking	3	Applications Emphasis ⁴	3
Applications Emphasis ⁴	3	Mathematical Sciences Requirement ⁵	3
	<u>17</u>		<u>16</u>

SENIOR YEAR

CPSC 422 Intro. to Operating Systems	3	Applications Emphasis ⁴	3
CPSC 428 Design and Impl. of Prog. Lang.	3	Computer Science Requirement ⁶	6
CPSC 491 Senior Seminar in Comp. Sci.	1	Humanities/Social Sciences Requirement ¹	3
Applications Emphasis ⁴	3	Elective	4
Computer Science Requirement ⁶	3		<u>16</u>
Elective	3		
	<u>16</u>		

134 Total Semester Hours

¹Select to satisfy Humanities a Social Sciences section, General Education Requirement, page 53.

²Select from the departmental list of approved natural science courses.

³ENGL 202, 203, 204, 205, 206, 207, 208, 209

⁴Consists of 12 hours in an applications area as specified courses in an applications area as specified by the department.

⁵Select from MTHSC 400, 405, 440, 441, 460 or other approved 400-level mathematical sciences courses.

⁶Select from 400-level computer science courses.

Notes:

1. For graduation, a candidate for the BS degree in Computer Science must have earned a grade of C or better in each computer science course applied to the degree.
2. A grade of C or better must be earned in all prerequisite courses before enrolling in the next computer science course.

GEOLOGY

Geology is a relatively young science. The word itself is only about 200 years old. It means the science of the earth. Such a science must be involved with the physics and chemistry of materials which comprise the earth, but equally important it must consider the development of life on earth. Fundamentally, the chemical, physical and biological responses to various environments on and in the earth must be thoroughly understood so that the historical development of the earth may be deduced, predictions of the future inferred, and natural resources intelligently developed.

Industry in our modern civilization is dependent on minerals and rocks. Metals have their origin in them as do our chief power sources: coal, petroleum, and radioactive minerals. The power and wealth of nations depend largely on their exploration, control and development of mineral wealth.

Geologists today are entering upon a new era. Widening horizons are indicated by employment not only in mineral-producing industries but by railroads, municipalities, engineering firms, and water authorities. For this reason, it is important that the geologist's education rest on a broad yet rigorous base.

This curriculum provides the student with the fundamentals in the geological sciences and excellent support in the other basic sciences. On successful completion of the Bachelor of Science program the student should be adequately prepared for employment or for graduate study in any field of geology.

FRESHMAN YEAR

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 102 or 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
GEOL 101 Physical Geology	3	GEOL 102 Historical Geology	3
GEOL 103 Physical Geology Lab.	1	GEOL 104 Historical Geology Lab.	1
MTHSC 106 Calculus of One Variable I	4	MTHSC 108 Calculus of One Variable II	4
	15		15

SOPHOMORE YEAR

BIOL 103 General Biology I	3	BIOL 104 General Biology II	3
BIOL 105 General Biology Lab. I	1	BIOL 106 General Biology Lab. II	1
HIST 172 Western Civilization	3	HIST 173 Western Civilization	3
MTHSC 206 Calculus of Sev. Var.	4	PHYS 122 Phys. with Cal. I	3
Literature Requirement ¹	3	Humanities Requirement	3
Modern Language ²	4	Modern Language ²	4
	18		17

JUNIOR YEAR

ENGL 314 Technical Writing	3	EXST 301 Introductory Statistics	3
GEOL 306 Mineralogy	3	GEOL 309 Petrology	3
PHYS 221 Phys. with Cal. II	3	PHYS 222 Phys. with Cal. III	3
PHYS 223 Physics Lab. II	1	PHYS 224 Physics Lab. III	1
Modern Language ²	3	Modern Language ²	3
Elective	3	Elective	3
	16		16

Summer Geology Field Course³ 6

SENIOR YEAR

GEOL 402 Structural Geology	3	GEOL 403 Invertebrate Paleontology	3
GEOL 413 Stratigraphy and Sedimentation	3	GEOL 404 Economic Geology	3
Elective	10	GEOL 410 Optical Mineralogy	3
	16	Elective	6
			15

134 Total Semester Hours

¹ENGL 202, 203, 204, 205, 206, 207, 208, 209.

²German or French is recommended. Two years of the same language are required.

³Clemson University does not conduct a field course in geology, but attendance at a course selected from the departmental list of approved summer geology field courses is required.

MATHEMATICAL SCIENCES

The Mathematical Sciences curriculum, carefully designed to possess a high degree of versatility, equips the student with the knowledge of mathematical concepts and methods that are applicable in the areas of physics, computer science, communication theory, data processing, statistics, operations research, economics, or any branch of the physical sciences in which a strong mathematical background is desired. In addition to containing the basic courses which provide the student with the mathematical skills necessary in the use of mathematics as it relates to other fields of knowledge, the curriculum allows the student in his junior year to select one of six optional sets of courses, providing an introduction to an area where mathematics is applied. These options are Actuarial Science, Applied Analysis, Biology, Computer Science, Operations Research/Management Science, and Statistics.

In addition to the overall goal of preparing the student to cope with the dynamics of any mathematical environment, the curriculum seeks to provide an adequate background for the student who plans to pursue graduate study in mathematics or to fill many interesting positions in space research, computer development, business, or government research. Those electing the Biology option will have the necessary preparation for entering medical school.

FRESHMAN YEAR

First Semester		Second Semester	
CPSC 110 Elem. Comp. Prog.	3	ECON 200 Economic Concepts	3
ENGL 101 Composition I	3	or ECON 211 Principles of Economics	3
HIST 172 or 173 Western Civilization	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I	4	MTHSC 108 Calculus of One Variable II	4
Foreign Language ¹	4	MTHSC 129 Prob. Solving in Disc. Math	3
	17	Foreign Language ¹	4
			17

SOPHOMORE YEAR

MTHSC 206 Calculus of Sev. Var.	4	MTHSC 208 Intro. to Ord. Diff. Equa	4
MTHSC 250 Intro. to Math. Science	1	MTHSC 311 Linear Algebra	3
MTHSC 360 Inter. Math. Computing	3	PHYS 122 Phys. with Cal. I	3
Literature Requirement ³	3	Literature Requirement ³	3
Science ⁴	4	Science ⁴	4
	15		17

JUNIOR YEAR

MTHSC 400 Theory of Probability	3	MTHSC 401 Statistical Methodology	3
MTHSC 440 Linear Programming	3	MTHSC 412 Intro. to Modern Algebra	3
Option	3	Option	3
Science ⁴	4-3	Science ⁴	4-3
Elective ²	3-4	Elective ²	3-4
	16		16

SENIOR YEAR

MTHSC 450 Intro. to Math. Models	3	MTHSC 454 Advanced Calculus II	3
MTHSC 453 Advanced Calculus I	3	or MTHSC 464 Math. Analysis II	3
or MTHSC 463 Math. Analysis I	3	Option	3
SPCH 250 Public Speaking	3	Elective	10
or ENGL 314 Technical Writing	3		16
Option	3		
Elective ²	4		
	16		

130 Total Semester Hours

OPTIONS

Operations Research/Management Science⁶

IE 482 Systems Modeling	3
or IE 384 Engr. Econ. Analysis	3
IE 486 Production Planning and Control	3
or MGT 402 Prod. and Op. Mgt. I	3
MTHSC 407 Regress. and Time-Series Analysis	3
MTHSC 441 Intro. to Stochastic Models	3
MTHSC 460 Intro. to Numerical Analysis I	3
	15

Applied Analysis

Applications Area ⁵	6
Two of the following courses:	
MTHSC 425 Orthogonal Functions and Boundary Value Problems	3
MTHSC 435 Complex Variables	3
MTHSC 460 Intro. to Numerical Analysis I	3
	12

Statistics

MASC 414 Statistical Analysis	3
MTHSC 403 Intro. to Statistical Theory	3
MTHSC 406 Sampling Theory and Meth.	3
MTHSC 407 Regress. and Time-Series Analysis	3
	12

¹Eight semester hours in the same language are required

²These electives must be approved by the adviser.

³ENGL 202, 203, 204, 205, 206, 207, 208, 209

⁴Must include two of the following sequences: BIOL 103, 104, 105, 106; CH 101, 102, or 112; ECON 314, MASC (ECON) 311; PHYS 221, 222, 223, 224.

⁵These courses must be approved by the adviser. Possibilities include CH 331, 332; EM 320; MTHSC 457, 458; PHYS 321, 322, and ECE (PHYS) 340, 341; ME 302

⁶Select the following sequence: ECON 314, MASC (ECON) 311

Notes:

1. For graduation, a candidate for the BS degree in Mathematical Sciences will be required to have a 2.0 or higher cumulative grade-point ratio in all required courses taught by the Mathematical Sciences Department including approved mathematical sciences electives and option courses.

2. A grade of C or better must be earned in all prerequisite courses before enrolling in the next mathematical science course.

MATHEMATICAL SCIENCES—BIOLOGY OPTION

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 110 Principles of Biology I ¹	5	BIOL 111 Principles of Biology II ¹	5
CPSC 110 Elem. Comp. Prog.	3	ENGL 102 Composition II	3
ENGL 101 Composition I	3	MTHSC 108 Calculus of One Variable II	4
MTHSC 106 Calculus of One Variable I	4	MTHSC 129 Prob. Solving in Disc. Math	3
	15	MTHSC 250 Intro. to Math. Sci.	1
			16

SOPHOMORE YEAR

CH 101 General Chemistry	4	CH 112 General Chemistry	4
MTHSC 206 Calculus of Sev. Var.	4	MTHSC 208 Intro. to Ord. Diff. Equa.	4
MTHSC 360 Inter. Math. Computing	3	MTHSC 311 Linear Algebra	3
PHYS 207 General Physics I	4	PHYS 208 General Physics II	4
Literature Requirement ²	3	Literature Requirement ²	3
	18		18

JUNIOR YEAR

CH 223 Organic Chemistry	3	CH 224 Organic Chemistry	3
CH 227 Organic Chemistry Lab.	1	CH 228 Organic Chemistry Lab.	1
MTHSC 400 Theory of Probability	3	MTHSC 401 Statistical Methodology	3
MTHSC 440 Linear Programming	3	MTHSC 412 Intro. to Mod. Alg.	3
Foreign Language ³	4	Foreign Language ³	4
Elective	2	Elective	2
	16		16

SENIOR YEAR

BIOSC 201 Plant Diversity	4	HIST 172 or 173 Western Civilization	3
or BIOSC 202 Animal Diversity	4	MTHSC 454 Adv. Calculus II	3
ECON 200 Economic Concepts	3	or MTHSC 464 Math. Analysis II	3
or ECON 211 Principles of Economics	3	SPCH 250 Public Speaking	3
MTHSC 450 Intro. to Math. Models	3	or ENGL 314 Technical Writing	3
MTHSC 453 Advanced Cal. I	3	Biological Science Elective ⁴	4-3
or MTHSC 463 Math. Analysis I	3	Elective ⁵	2-3
Elective	3		15
	16		

130 Total Semester Hours

¹Those qualifying for advance placement in languages or wanting to take languages the freshman year may take them in place of these courses

²ENGL 202, 203, 204, 205, 206, 207, 208, 209.

³In the same language.

⁴Select from BIOCH 301, GEN 302, MICRO 305, or any 300- and 400-level biological science or zoology course.

⁵Electives must be approved by adviser.

Notes:

1. For graduation, a candidate for the BS degree in Mathematical Sciences will be required to have a 2.0 or higher cumulative grade-point ratio in all required courses taught by the Mathematical Sciences Department including approved mathematical sciences electives and option courses.

2. A grade of C or better must be earned in all prerequisite courses before enrolling in the next mathematical science course

MATHEMATICAL SCIENCES—COMPUTER SCIENCE OPTION**FRESHMAN YEAR****First Semester**

CPSC 110 Elem. Comp. Prog. ⁶	3
ENGL 101 Composition I	3
HIST 172 or 173 Western Civilization	3
MTHSC 106 Calculus of One Variable I	4
Foreign Language ¹	4
	17

Second Semester

ECON 200 Economic Concepts	3
or ECON 211 Principles of Economics	3
ENGL 102 Composition II	3
MTHSC 108 Calculus of One Variable II	4
MTHSC 129 Prob. Solving in Disc. Math.	3
Foreign Language ¹	4
	17

SOPHOMORE YEAR

CPSC 210 Programming Methodology ⁶	4	CPSC 230 Assembly Lang. Prog.	3
MTHSC 206 Cal. of Several Variables	4	MTHSC 208 Intro. to Ord. Diff. Equa.	4
MTHSC 250 Intro. to Math. Science	1	MTHSC 311 Linear Algebra	3
Literature Requirement ³	3	Literature Requirement ³	3
Science Requirement ⁴	4	Science Requirement ⁴	4
	16		17

JUNIOR YEAR

MTHSC 360 Inter. Math. Comp.	3	ENGL 314 Technical Writing	3
MTHSC 400 Theory of Probability	3	or SPCH 250 Public Speaking	3
MTHSC 440 Linear Programming	3	MTHSC 401 Statistical Methodology	3
PHYS 122 Phys. with Cal. I	3	MTHSC 412 Intro. to Mod. Alg.	3
Science Requirement ⁴	3-4	Computer Science Requirement ⁵	4-3
	15-16	Science Requirement ⁴	3-4
			15-16

SENIOR YEAR

MTHSC 450 Intro. to Math. Models	3	MTHSC 454 Advanced Calculus II	3
MTHSC 453 Advanced Calculus I	3	or MTHSC 464 Math. Analysis II	3
or MTHSC 463 Math. Analysis I	3	Computer Science Requirement ⁵	3
MTHSC 460 Intro. to Numerical Analysis I	3	Elective	10
Elective ²	7-9		16
	16-18		

130 Total Semester Hours

¹Eight semester hours in the same language are required

²These electives must be approved by the adviser.

³ENGL 202, 203, 204, 205, 206, 207, 208, 209.

⁴Must include two of the following sequences: BIOL 103, 104, 105, 106; CH 101; 102 or 112; ECON 314, MASC (ECON) 311, PHYS 221, 222, 223, 224

⁵Select from CPSC 240 or from 300- and 400-level computer science courses or mathematical sciences computing courses

⁶Students may pursue alternate sequence: CPSC 101, 102, 150.

Notes:

1. For graduation, a candidate for the BS degree in Mathematical Sciences will be required to have a 2.0 or higher cumulative grade-point ratio in all required courses taught by the Mathematical Sciences Department including approved mathematical sciences electives and option courses.

2. A grade of C or better must be earned in all prerequisite courses before enrolling in the next mathematical science course.

MEDICAL TECHNOLOGY

Medical technology is the area of health care in which analyses are performed on human body fluids in order to detect disease conditions. The medical technologist in a modern hospital laboratory must know how to perform and evaluate tests made in several broad disciplines, which include clinical chemistry, clinical microbiology, immunohematology, hematology, and blood bank. In order to perform in such diversified areas medical technologists are required to have a broad education in the basic sciences and rigorous training in clinical laboratory science. Medical technologists must know both the principles of test procedures and equipment, as well as the significance of the results of these tests in a diagnosis and treatment of disease. Medical technologists find employment in hospital clinical laboratories and in private, state, and federal health laboratories.

The program in Medical Technology at Clemson University consists of three years of lectures and laboratories on the Clemson campus and one year of clinical experience at an accredited school of medical technology. The courses required in the first three years of the program must be completed before the student can begin the clinical (fourth) year. The student must be in good standing at the University and have a grade-point ratio of 2.0 or above before entering a school of medical technology. Admission to these schools is by competition. Each school selects the students who will come to their school. This selection is made on the basis of published admission criteria which include grade-point ratio, grades in science courses, letters of reference, and interviews. Clemson University is affiliated with Anderson Memorial Hospital and McLeod Regional Medical Center. Applications to these schools should be made during the first semester of the junior year.

Upon satisfactory completion of the requirements of the curriculum, the student will receive the Bachelor of Science degree in Medical Technology from Clemson University. In addition to the degree, satisfactory performance on a certification exam is required by most employers.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 110 Principles of Biology I	5	BIOL 111 Principles of Biology II	5
CH 101 General Chemistry	4	CH 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MT 101 Intro. to Med. Tech.	1	EXST 301 Introductory Statistics	3
MTHSC 106 Calculus of One Variable I	4	or MTHSC 301 Stat. Theory and Meth. I	3
	17	Elective	3
			18

SOPHOMORE YEAR

CH 223 Organic Chemistry	3	BIOCH 301 General Biochemistry	3
CH 227 Organic Chemistry Lab.	1	CH 224 Organic Chemistry	3
HIST 172 or 173 Western Civilization	3	CH 228 Organic Chemistry Lab.	1
MICRO 305 General Microbiology	4	PHYS 208 General Physics II	4
PHYS 207 General Physics I	4	Humanities Requirement ³	3
Literature Requirement ¹	3	Elective	3
	18		17

JUNIOR YEAR

CH 313 Quantitative Analysis	3	GEN 302 Introductory Genetics	4
CH 317 Quan. Anal. Lab	1	MICRO 411 Pathogenic Bacteriology	4
MICRO 414 Basic Immunology	3	Humanities Requirement ³	3
English Requirement ²	3	Option Requirement ⁴	3
Elective	4	Social Science Requirement ³	3
	<u>14</u>		<u>17</u>

SENIOR YEAR

(52 Weeks)

MT 401 Immunology	3
MT 402 Clinical Microbiology	8
MT 403 Hematology and Hemostasis	5
MT 404 Blood Bank	4
MT 407 Urinalysis	2
MT 408 Clinical Chemistry	10
MT 491 Special Topics in Med. Tech.	2
	<u>34</u>

135 Total Semester Hours

¹ENGL 202, 203, 204, 205, 206, 207, 208, 209.²Select from advanced writing or public speaking.³Select from courses required to complete an alternate degree in Microbiology should the student not be accepted to a hospital school after completion of the academic requirement for the baccalaureate degree in Medical Technology.⁴The option requirement is to be selected from the following: MICRO 400, 401, 412, 413, 415, 416, ZOOL 456, and other courses that will serve as background courses for medical technology.

Note: The manner in which each accredited clinical program implements the above curriculum may vary because of institutional differences.

MICROBIOLOGY

Microbiology deals with the study of bacteria, viruses, yeasts, filamentous fungi, protozoa, and unicellular algae. The microbiologist seeks to describe these organisms in terms of their structures, functions and processes of reproduction, growth and death, at both the cellular and molecular levels. He is also concerned with their ecology, particularly in regard to their pathological effects on man, and with their economic importance.

The Microbiology major provides a thorough training in the basic microbiological skills. Furthermore, the student receives instruction in mathematics, physics, chemistry, and biochemistry, all of which are essential to the training of a modern-day microbiologist. Through a wide choice of electives, the program allows a student to prepare for a variety of careers. The Microbiology curriculum with Molecular Biology option is recommended for students planning postgraduate programs. The microbiology graduate may enter graduate school in the fields of microbiology, biochemistry, bioengineering or related disciplines; he may enter a medical or dental school; or pursue a career in one of the many industries or public service departments dependent upon microbiology. Some of these are the fermentation and drug industries, medical and public health microbiology, various food industries, and agriculture.

Microbiology majors planning to apply for admission to a medical or dental school should inform their advisers immediately upon entering the Microbiology program.

FRESHMAN YEAR**First Semester**

BIOL 110 Principles of Biology I	5
CH 101 General Chemistry	4
ENGL 101 Composition I	3
MT HSC 106 Calculus of One Variable I	4
	<u>16</u>

Second Semester

BIOL 111 Principles of Biology II	5
CH 112 General Chemistry	4
ENGL 102 Composition II	3
MICRO 100 Microbes and Human Affairs	1
Mathematical Science Requirement ²	3-4
	<u>16-17</u>

SOPHOMORE YEAR

CH 223 Organic Chemistry	3	BIOCH 301 General Biochemistry	3
CH 227 Organic Chemistry Lab.	1	CH 224 Organic Chemistry	3
MICRO 305 General Microbiology	4	CH 228 Organic Chemistry Lab.	1
Literature Requirement ¹	3	Literature Requirement ¹	3
Math. Sci. or Sci. Elective ³	3-4	Math. Sci. or Sci. Elective ³	4-3
Social Science Elective	3	Microbiology Elective ⁴	3
	<u>17-18</u>		<u>17-16</u>

JUNIOR YEAR

MICRO 401 Adv. Bacteriology	4	GEN 302 Introductory Genetics	4
SPCH 250 Public Speaking	3	MICRO 412 Bacterial Physiology	4
Physics Elective ⁵	4-3	Physics Elective ⁵	4
Elective	6-7	Social Science Elective	3
	<u>17</u>	Elective	3
			<u>18</u>

SENIOR YEAR

Social Science Elective	3	MICRO 411 Path. Bacteriology	4
Elective ⁴	14-13	Elective ⁴	12
	<u>17-16</u>		<u>16</u>

134 Total Semester Hours

¹ENGL 202, 203, 204, 205, 206, 207, 208, 209.

²MTHSC 108 is required for the Microbiology-Molecular Biology option. Microbiology majors may select MTHSC 108 or 301.

³Select from CPSC 110, EXST 301, GEOL 101, MTHSC 108, or any course at the sophomore level or above offered by the College of Sciences, excluding microbiology.

⁴A minimum of 15 credits must be selected from the following courses: BOT 411, 413, MICRO 400, 403, 407, 410, 413, 414, 415, 416, 417, 491, PLPA 456, PS 458, ZOOL 403, 456.

⁵To be selected from the following course sequences: either PHYS 207, 208 or 122, 221, 223.

Note: This curriculum provides a minimum of 22 open approved electives. Military science or aerospace studies may be elected if desired.

MICROBIOLOGY—MOLECULAR BIOLOGY OPTION

See Microbiology curriculum for Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
CH 223 Organic Chemistry	3	BIOCH 301 General Biochemistry	3
CH 227 Organic Chemistry Lab.	1	CH 224 Organic Chemistry	3
MICRO 305 General Microbiology	4	CH 228 Organic Chemistry Lab.	1
Literature Requirement ¹	3	Literature Requirement ¹	3
Mathematical Science Requirement ³	3	Microbiology Elective ²	3
Social Science Elective	3	Social Science Elective	3
	<u>17</u>		<u>16</u>

JUNIOR YEAR

MICRO 402 Adv. Bacteriology	4	CH 313 Quantitative Analysis	3
MICRO 414 Basic Immunology	3	or PHYS 417 Intro. to Biophys. I	3
SPCH 250 Public Speaking	3	GEN 302 Introductory Genetics	4
Physics Elective ⁴	4-3	MICRO 412 Bacterial Physiology	4
Elective ⁵	3-4	Physics Elective ⁴	4
	<u>17</u>	Elective ⁵	3
			<u>18</u>

SENIOR YEAR

BIOCH 423 Prin. of Biochemistry	3	BIOCH 424 Prin. of Biochemistry	3
MICRO 415 Microbial Genetics	4	MICRO 411 Path. Bacteriology	4
MICRO 416 Introductory Virology	3	MICRO 491 Special Problems	2
Social Science Elective	3	Elective ⁵	8
Elective ⁵	3		<u>17</u>
	<u>16</u>		

134 Total Semester Hours

¹ENGL 202, 203, 204, 205, 206, 207, 208, 209.

²Select from BOT 411, 413, MICRO 400, 403, 407, 410, 413, 417, PLPA 456, PS 458, ZOOL 403, 456.

³Select from CPSC 110, EXST 301, MTHSC 301.

⁴Select from the following course sequences: Either PHYS 207, 208 or 122, 221, 223.

⁵Should include one of the following courses: CH 313, 317, CPSC 110, EXST 301.

Note: Recommended electives in addition to those listed above are BIOCH 425, 426, BIOE 401, MTHSC 206, PHYS 473, ZOOL 459.

This option provides 17 semester hours of open approved electives. Military science or aerospace studies may be elected if desired.

PHYSICS

Physics is the most fundamental of the natural sciences, and it forms the basis upon which the study of other branches of science is founded. Physics is concerned with the fundamental behavior of matter and energy. Classical physics encompasses the fields of mechanics, heat and thermodynamics, electricity and magnetism, acoustics and optics. Modern physics is concerned with the study of atoms and molecules, atomic nuclei, elementary particles and the properties of liquids, crystalline solids, and other materials. It also includes the areas of relativity, cosmology, and the large-scale structure of the universe.

The undergraduate Physics curricula are designed to provide students with a strong background in the classical areas of physics as well as a basic introduction into the more important aspects of modern physics. The BS in Physics curriculum is directed toward preparing students for graduate study ultimately leading to the PhD degree or toward research and development work in industrial or governmental laboratories. It also provides a good background for graduate study or industrial work in many areas of engineering and applied science. Experimental modern physics is strongly emphasized.

FRESHMAN YEAR

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
HIST 172 or 173 West. Civilization	3	MTHSC 108 Calculus of One Variable II	4
MTHSC 106 Calculus of One Variable I	4	PHYS 122 Phys. with Cal. I	3
PHYS 101 Current Topics in Modern Physics	1	PHYS 124 Physics Lab. I	1
	15		15

SOPHOMORE YEAR

FR 101 Elementary French ¹	4	FR 102 Elementary French ¹	4
or CER 101 Elementary German ¹	4	or CER 102 Elementary German ¹	4
MTHSC 206 Calculus of Sev. Var.	4	MTHSC 208 Intro. to Ord. Diff. Equa.	4
PHYS 221 Phys. with Cal. II	3	PHYS 222 Phys. with Cal. III	3
PHYS 223 Physics Lab. II	1	PHYS 224 Physics Lab. III	1
Literature Requirement ²	3	Computer Science (as approved)	3
	15	Literature Requirement ²	3
			18

JUNIOR YEAR

ECE (PHYS) 340 Electromagnetics I	2	ECE (PHYS) 341 Electromagnetics II	2
ENGL 314 Technical Writing	3	PHYS 322 Mechanics II	3
or SPCH 250 Public Speaking	3	PHYS 326 Exper. Physics II	3
MTHSC 425 Orthogonal Functions	3	Option	3
and Boundary Value Problems	3	Elective	6
PHYS 321 Mechanics I	3		17
PHYS 325 Exper. Physics I	3		
Option	3		
	17		

SENIOR YEAR

PHYS 401 Senior Thesis I	3	Physics (as approved)	3
or PHYS 427 Instr. in Exp. Phys.	3	Option	3
PHYS 442 Electromagnetic Theory	3	Social Science Requirement	3
PHYS 455 Quantum Physics I	3	Approved Elective	4
PHYS 465 Therm. and Stat. Mech.	3	Elective	4
Option	3		17
	15		

OPTIONS

Electronics³

ECE 202 Electric Circuits I	3
ECE 301 Electric Circuits II	3
ECE 320 Electronics I	3
ECE 330 Elec. Sys. Analysis	3
	<u>12</u>

Chemical Physics

CH 331 Physical Chemistry	3
CH 332 Physical Chemistry	3
CH 402 Inorganic Chemistry	3
or PHYS 456 Quantum Physics II	3
CH 435 Spec. and Molec. Struc.	3
	<u>12</u>

Astrophysics

ASTR 301 General Astronomy	3
ASTR 302 Astrophysics	3
Astronomy (two 400-level courses)	6
	<u>12</u>

Mathematical Physics

MTHSC 434 Adv. Engr. Math.	3
MTHSC 435 Complex Variables	3
PHYS 456 Quantum Physics II	3
Mathematical Science (as approved)	3
	<u>12</u>

Geophysics

GEOL 101 Physical Geology	3
GEOL 103 Physical Geology Lab.	1
GEOL 306 Mineralogy	3
Any Two:	
GEOL 309 Petrology	3
GEOL 402 Structural Geology	3
PHYS 446 Solid State Physics	3
	<u>13</u>

Computer Science

CPSC 110 Elem. Comp. Prog.	3
CPSC 230 Assem. Lang. Prog.	3
Computer Science (as approved)	3
or PHYS 446 Solid State Phys	3
MTHSC 460 Intro. to Num. Analysis I	3
	<u>12</u>

Physics

PHYS 446 Solid State Physics	3
PHYS 456 Quantum Physics II	3
Mathematical Science (as approved)	6
	<u>12</u>

¹RUSS 101, 102 may be substituted.

²ENGL 202, 203, 204, 205, 206, 207, 208, 209

³Students in the Electronics Option must take ECE 203 and 303 in lieu of 2 credits of approved electives.

PHYSICS—BIOPHYSICS OPTION

The Biophysics option offers an excellent preparation for medical school or graduate work in biological science. It requires a total of 25 credits of approved electives in chemistry, biological science, physics, or mathematics.

FRESHMAN YEAR

First Semester

BIOL 110 Principles of Biology I	5
CH 101 General Chemistry	4
ENGL 101 Composition I	3
MTHSC 106 Calculus of One Variable I	4
PHYS 101 Current Topics in Modern Physics	1
	<u>17</u>

Second Semester

CH 102 General Chemistry	4
ENGL 102 Composition II	3
MTHSC 108 Calculus of One Variable II	4
PHYS 122 Phys. with Cal. I.	3
PHYS 124 Physics Lab. I	1
Elective	3
	<u>18</u>

SOPHOMORE YEAR

MTHSC 206 Calculus of Sev. Var.	4
PHYS 221 Phys. with Cal. II	3
PHYS 223 Physics Lab. II	1
Biophysics Requirement ¹	4
Literature Requirement ³	3
	<u>15</u>

MTHSC 208 Intro. to Ord. Diff. Equa.	4
PHYS 222 Phys. with Cal. III	3
PHYS 224 Physics Lab. III	1
Biophysics Requirement ¹	4
Literature Requirement ³	3
	<u>15</u>

JUNIOR YEAR

ECE (PHYS) 340 Electromagnetics I	2
FR 101 Elementary French ²	4
or GER 101 Elementary German ²	4
PHYS 321 Mechanics I	3
PHYS 325 Experimental Physics I	3
Biophysics Requirement ¹	3
Social Science Requirement	3
	<u>18</u>

ECE (PHYS) 341 Electromagnetics II	2
FR 102 Elementary French ²	4
or GER 102 Elementary German ²	4
HIST 172 or 173 Western Civilization	3
PHYS 322 Mechanics II	3
Biophysics Requirement ¹	3
	<u>15</u>

SENIOR YEAR

PHYS 455 Quantum Physics I	3	ENGL 314 Technical Writing	3
PHYS 465 Thermodynamics and Statistical Mechanics ⁴	3	or SPCH 250 Public Speaking	3
Biophysics Requirement ¹	3	Biophysics Requirement ¹	6
Computer Science (as approved)	3	Physics (as approved)	3
Elective	3	Elective	4
	15		16

129 Total Semester Hours

¹Select from an approved course list from offerings in physics, chemistry, mathematics, and the biological sciences. At least six hours must be in the biological sciences.

²RUSS 101, 102 may be substituted.

³ENGL 202, 203, 204, 205, 206, 207, 208, 209.

⁴An approved physics course may be substituted for PHYS 465 if the student satisfactorily completes CH 331, 332.

PREPROFESSIONAL HEALTH STUDIES

The health professions, such as medicine and dentistry, need individuals with a diversity of educational backgrounds and a wide variety of talents and interests. The philosophies of education, the specific preprofessional course requirements, the noncognitive qualifications for enrollment, and the systems of training vary among the professional health schools, but all recognize the desirability of a broad education—a good foundation in the natural sciences (biology, chemistry, mathematics, and physics), highly developed communication skills, and a solid background in the humanities and social sciences. The absolute requirements for admission to professional health schools are purposely limited to allow latitude for developing individualized undergraduate programs of study; however, all schools of medicine and dentistry require sixteen semester hours of chemistry, including organic chemistry, eight semester hours of biological sciences, eight semester hours of physics, and at least one course in calculus. These requirements in the natural sciences should be balanced with courses in vocabulary building, the humanities (literature, music, art, history, philosophy), and social sciences (economics, political science, psychology, sociology). The basic requirements in the natural sciences and as many as possible of the courses in the humanities and the social sciences should be completed by the third year of study so that the student will be prepared to take the Dental Admission Test or the Medical College Admission Test prior to making application to a professional school.

Undergraduates may prepare also to study optometry, podiatry, and other health professions. While the basic requirements for these professional schools are essentially the same as those for schools of medicine and dentistry, specific requirements for individual schools in these professions vary somewhat; consequently, the interested student is advised to consult with the Coordinator for Professional Health Studies.

At Clemson, rather than having a separate, organized preprofessional health study program, it is felt that an undergraduate student should be allowed to major in any curriculum, so long as the basic entrance requirements of the chosen professional health school are fulfilled. These schools are not so much concerned about a student's major as they are concerned that the student does well in whichever curriculum he chooses.

Professional health schools have neither preferences nor prejudices concerning any curriculum, which is evidenced by the fact that their entering students represent a broad spectrum of curricula. The emphasis is placed on the student doing well in the curriculum chosen, and this becomes critical as competition increases for the limited number of places available in professional health schools.

PREPHYSICAL THERAPY

Physical Therapy is a transfer, baccalaureate degree program at the Medical University of South Carolina. Beginning in 1990, this will be replaced by a postbaccalaureate degree. Students may acquire the prerequisites for the current program by following the suggested curriculum offered by Clemson University. For the postbaccalaureate degree, additional courses will be required.

FIRST YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	3	BIOL 104 General Biology II	3
BIOL 105 General Biology Lab. I	1	BIOL 106 General Biology Lab. II	1
CH 101 General Chemistry ¹	4	CH 102 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
PSYCH 201 Intro. to Psychology	3	Psychology Elective	3
Mathematical Sciences Elective ²	3-5	Elective	3
	17-19		17

SECOND YEAR

PHYS 207 General Physics I ¹	4	PHYS 208 General Physics II	4
ZOOL 222 Human Anatomy	4	ZOOL 223 Human Physiology	4
Humanities Elective	3	Humanities Elective	6
Social Science Elective	3	Elective	3
Elective	3		17
	17		

68-70 Total Semester Hours

¹Chemistry requires proficiency in algebra, and physics requires proficiency in trigonometry; therefore, entering freshmen must present a score of 550 or above on Level II of the Mathematics Achievement Test or register in the first semester for MTHSC 105

²May be replaced by MTHSC 105 if necessary to satisfy the footnote above.

PREPHARMACY

Prepharmacy is a five-year program. The first two years can be taken at Clemson as a Prepharmacy major. Upon completion of the following curriculum, the student will transfer to a college of pharmacy, usually the Medical University of South Carolina or the University of South Carolina. The Bachelor of Pharmacy is awarded by the institution attended. It is important for the student to work closely with the adviser as there are variations in courses required by the pharmacy schools.

FIRST YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	3	BIOL 104 General Biology II	3
BIOL 105 General Biology Lab. I	1	BIOL 106 General Biology Lab. II	1
CH 101 General Chemistry ¹	4	CH 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I	4	History or Economics Elective ²	3
History Elective ²	3	Other Required Courses ³	4
	18		18

SECOND YEAR

CH 223 Organic Chemistry	3	CH 224 Organic Chemistry	3
CH 227 Organic Chemistry Lab.	1	CH 228 Organic Chemistry Lab.	1
PHYS 207 General Physics I ²	4	PHYS 208 General Physics II	4
Other Required Courses ³	10	Other Required Courses ³	10
	<u>18</u>		<u>18</u>

72 Total Semester Hours

¹Chemistry requires proficiency in algebra, and physics requires proficiency in trigonometry; therefore, entering freshmen must present a score of 550 or more on Level II of the Mathematics Achievement Test or register in the first semester for MTHSC 105

²Six hours of history are required by the Medical University of South Carolina; 3 hours each of history and economics are required by the University of South Carolina

³Courses are to be selected after consultation with an adviser. Six hours of liberal arts or humanities are required by the Medical University of South Carolina; ZOOL 222 and 223 are required by the University of South Carolina



Geology Laboratory 1915

Description of Courses

This list of courses includes for each course the catalog number, title of course, credit in semester hours, class laboratory hours per week, and the description of the course. In general, courses numbered 600 and above are graduate courses and are open only to students admitted to the graduate school, except that seniors with exceptional records may be enrolled with special permission. Where courses are offered on a schedule, there is a designation F, S or SS following the title of each course, indicating whether it is customarily offered in the fall, spring, or summer school.

ACCOUNTING (ACCT)

Professors: J. R. Davis, G. T. Friedlob, J. G. Louderback, J. D. Sheriff, J. E. Trapnell, *Director;* J. A. Turner, Jr.; *Associate Professors:* E. L. Bryan, L. S. Cash, L. S. Clark, T. L. Dickens, R. K. Doost, A. C. Drews-Bryan, F. R. Gray, L. P. Ramsay, R. E. Welton, Jr.; *Assistant Professor:* L. S. Schleifer; *Lecturers:* T. R. Bismack, N. E. Byerley, V. D. Guide, R. M. Lagrone, C. C. Leuck, W. R. Owens, Jr., M. A. Prater, C. J. Ringeisen; *Visiting Lecturers:* J. R. Madray, S. M. Tuten

101 (FIN) Accounting and Finance Orientation 1(1,0) A broad overview of the nature of accounting and finance and their role in the industrial, financial, and governmental environments. If taken for credit, this course must be completed before or concurrently with ACCT 200 or 201. *Preq:* Freshman or Sophomore standing or consent of instructor.

200 Basic Accounting 3(3,0) This course is designed as a general survey of accounting for the student requiring only a basic knowledge of principles and concepts. May not be taken by students in curricula requiring ACCT 201 or 203.

201, H201 Principles of Accounting 3(3,0) Introduction to the role of accounting, basic concepts and methodology, processing of business transactions, valuation and income determination principles, and financial statement preparation.

202, H202 Principles of Accounting 3(3,0) Continuation of ACCT 201, covering accounting for the corporate form of the business entity and elements of accounting for management planning, budgeting, and control. Emphasis is on management uses of accounting information. *Preq:* ACCT 201.

203 Financial Accounting 3(3,0) Emphasizes the principles and methods which influence the financial statements provided to external users. May not be taken by students in curricula requiring ACCT 200 or 201.

210 Federal Taxation for Non-Accountants 3(3,0) Survey of the taxation of individuals, corporations, partnerships, estates, gifts, and trusts for the general business and nonbusiness student. Open to all majors but may not be taken for credit by Accounting or Financial Management majors.

301, H301 Intermediate Accounting 3(3,0) Indepth treatment of the traditional financial accounting topics of current assets, noncurrent assets, and present values as well as recent developments in accounting valuation, reporting practices, environment of accounting, and basic theory underlying financial accounting. *Preq:* ACCT 202.

302, H302 Intermediate Accounting 3(3,0) Indepth treatment of the traditional financial accounting topics of current liabilities, long-term liabilities, stockholders' equity, earnings per share, investments, revenue recognition, leases, and statement of changes in financial position. *Preq:* ACCT 301.

303, H303 Cost Accounting 3(3,0) The application of cost analysis to manufacturing and distributing problems. Analysis of behavior characteristics of business costs and a study of principles involved in standard cost systems. Lectures and problems. *Preq:* ACCT 202.

307, H307 Managerial Accounting 3(3,0) Emphasizes internal use of accounting data by the manager in establishing plans and objectives, controlling operations, and making decisions involved with management of an enterprise. Cannot be taken for credit by Accounting majors. *Preq:* ACCT 202 or 203.

401 Financial Accounting Problems 3(3,0) Indepth treatment of the traditional financial accounting topics of deferred income taxes, pension costs, accounting changes and error analysis, disclosure, accounting for partnerships, as well as introduction to fund accounting concepts. *Preq:* ACCT 302.

403 Selected Topics in Accounting 3(3,0) Course provides for indepth study and research into one or a few accounting topics chosen by the instructor. *Preq:* Consent of instructor.

404, H404, 604 Individual Taxation 3(3,0) Interpretation of Federal income tax laws, regulations, and court decisions with practice in application of these laws to the returns of individuals, partnerships, and corporations. *Preq:* ACCT 202 or 203 with consent of instructor.

405 Corporate Taxation 3(3,0) Tax planning and research, income taxation with emphasis on special problems applicable to corporations, partnerships, estates and trusts. *Preq:* ACCT 202 or 203 with consent of instructor.

407 Accounting Research 1(1,0) Directed research course for students interested in a career in accounting. *Preq:* ACCT 302 and ENGL 304.

410, 610 Budgeting and Executive Control 3(3,0) Study and application of selected techniques used in the planning and control functions of business organizations. *Preq:* ACCT 303 or 307.

411 Financial Accounting Problems 3(3,0) Study of accounting principles and practices relating to business combinations and foreign operations. *Preq:* ACCT 401 or consent of instructor.

415 Auditing 3(3,0) Professional and practical auditing theory. Review of internal controls, audit procedures, and development of audit programs for various types of businesses; consideration of auditor's professional and ethical standards. *Preq:* ACCT 302.

416 Auditing in an Electronic Data Processing Environment 3(3,0) Application of electronic data processing controls as they relate to the auditing function. The course focuses on the evaluation of controls and data in an automatic environment. *Preq:* ACCT 415 and 422, or consent of instructor.

420 Certified Public Accountant Problems 3(3,0) Intensive practice in analyzing and solving certified public accountant-level accounting problems. Offered only on pass/fail basis for free elective credit. *Preq:* ACCT 411 or consent of instructor.

422 Accounting Information Systems 3(3,0) Study of computer-based accounting systems with attention to systems design, application, internal control, auditing the system, and system security. *Preq:* ACCT 301 and CPSC 130.

425 Contemporary Accounting Theory 3(3,0) Contemporary accounting theory emphasizes the major challenges and controversies within the field of accounting today. Attention is given to theoretical and conceptual issues underlying current financial reporting as well as pragmatic conventions. The evolution of accounting objectives and standards, as evidenced by the pronouncements of professional organizations, will receive special emphasis. *Preq:* ACCT 302.

430, 630 Governmental and Institutional Accounting 3(3,0) Accounting and reporting principles, standards, and procedures used by the Federal government, state and local governments, and other not-for-profit institutions are examined and discussed. Hospital and university accounting are reviewed. Unique aspects of the governmental auditing environment are analyzed. *Preq:* ACCT 302 or consent of instructor.

440 Internal Auditing Theory 3(3,0) Introduces the student to internal auditing and covers internal auditing standards, ethics, concepts, audit techniques, and reporting practices. *Preq:* ACCT 302.

445 Internal Auditing Practice 3(3,0) Expands the student's knowledge of internal auditing practice, including operation audits, organization audits, quality-control audits, and organization theory. *Preq:* ACCT 440.

- 801 Contemporary Financial Accounting Theory 3(3,0)
- 802 Advanced Auditing I 3(3,0)
- 803 Accounting Information Systems 3(3,0)
- 804 The Environment of Accounting 3(3,0)
- 805 Research Seminar in Accounting 1(1,0)
- 806 Seminar in Current Accounting Problems 3(3,0)
- 807 Advanced Auditing II 3(3,0)
- 815 Federal and State Income Taxation of Corporations 3(3,0)
- 816 Taxation of Estates, Gifts and Fiduciaries 3(3,0)
- 817 Tax Planning and Research 3(3,0)
- 818 Taxation of Partnerships 3(3,0)
- 819 Special Topics in Taxation 3(3,0)
- 821 Controllorship 3(3,0)
- 822 Management Accounting in Textiles and Manufacturing 3(3,0)
- 823 Management Accounting in Financial Institutions 3(3,0)
- 840 Internal Auditing Seminar 3(3,0)

AEROSPACE STUDIES (AS)

Professor: G. E. Musselwhite, *Head*; *Assistant Professors:* M. C. Ashton, D. D. Nave, S. N. Severance

109 Air Force Today I 1(1,1) Course deals with the Air Force in the contemporary world through a study of the total force structure: strategic offensive and defensive, general purpose, and aerospace support. Leadership laboratory activities include drill fundamentals, customs, and courtesies of the service.

110 Air Force Today II 1(1,1) Continuation of AS 109. Leadership laboratory includes drill, ceremonies, and an introduction of Air Force career opportunities.

209 Development of Air Power I 1(1,1) The course includes the study of the development of air power from balloons and dirigibles through the peaceful employment of U.S. air power in relief missions and civic action programs in the late 1970s and also the air war in Southeast Asia. Leadership laboratory provides experience in guiding, directing, and controlling an Air Force unit.

210 Development of Air Power II 1(1,1) Continuation of AS 209.

309 Air Force Leadership and Management I 3(3,1) Course emphasizing the individual as a manager. Individual motivational and behavioral processes, leadership, communication, and group dynamics are covered to provide a foundation for the development of the Air Force officer's professional skills. Students will prepare individual and group presentations; write reports; participate in group discussions, seminars, and conferences.

310 Air Force Leadership and Management II 3(3,1) Continuation of AS 309, using the basic managerial processes involving decision-making, utilization of analytical aids in planning, organizing, and controlling environment. Actual case studies are used to enhance learning and communication processes.

409 National Security Policy I 3(3,1) Analysis of the role and function of the military officer in a democratic society and the relationships involved in civil-military interactions. Students will be expected to prepare individual and group presentations for the class, write reports, and participate in group discussions.

410 National Security Policy II 3(3,1) Continuation of AS 409, examining the environmental context in which U.S. defense policy is formulated and implemented. Emphasis placed on initial commissioned service and military justice. Students will be expected to prepare individual and group presentations for the class, write reports, and participate in group discussions, seminars, and conferences.

AGRICULTURAL ECONOMICS (AGEC)

Professors: L. L. Bauer, G. L. Bradford, *Head*; B. L. Dillman, J. E. Faris, M. D. Hammig, M. S. Henry, J. C. Hite, K. H. Kahl, E. L. McLean, S. E. Miller, C. S. Thompson, G. J. Wells; *Associate Professors:* E. H. Kaiser, J. C. Nyankori, C. P. Rosson III; *Assistant Professor:* R. S. Pomeroy

202 Agricultural Economics 3(3,0)F, S Analytical survey of the various subdivisions of agricultural economics, to include farm organization, enterprise, land economics, marketing, farm prices, governmental farm policies, and the relation of agriculture to the national and international economy.

302 Economics of Farm Management 3(2,3)F Economic principles underlying the organization and operation of agricultural firms and related business enterprises. Particular emphasis is directed to management aspects of the farm as a production unit. *Preq:* AGECE 202 or ECON 211.

308 Quantitative Agricultural Economics 3(3,0)S Basic quantitative relationships in agricultural economics are examined and interpreted using mathematics. Emphasis is placed on the use of deterministic models in agricultural production and marketing and in the examination of the interrelationships between the performance of the U.S. economy and the agricultural sector. *Preq:* AGECE 202 or ECON 211; EXST 301 or MTHSC 203; MTHSC 102 or 106.

309, H309 Economics of Agricultural Marketing 3(3,0)F General course in marketing agricultural commodities with particular emphasis upon food products. Efficiency criteria, consumer behavior, market organizations and institutions, and marketing functions are analyzed. *Preq:* AGECE 202.

313 Principles of Real Estate Appraisal 3(3,0) Introduction to the basic principles and procedures of real estate appraisal. Topics include the real estate market; principles of valuation; legal concepts; and the application of the comparable sales, cost, and income approaches to real estate valuation. *Preq:* FIN 307 or consent of instructor.

319 Agribusiness Management 3(3,0)F Study of the principles used in making management decisions and the application of these principles in agribusiness. Emphasis is given to the application of economics to the solution of problems facing managers of agricultural supply and marketing firms. *Preq:* AGECE 302 or 309.

333 Agricultural Law and Related Environmental Issues 3(3,0) Introduction to agricultural and agricultural-related environmental legal issues. Topics include a review of laws, agencies, programs, the court structure, torts, taxation, regulated industry, and environmental liabilities, including biotechnology and land and water use as related to agriculture.

351 Agricultural Sales, Merchandising, and Advertising 3(3,0)F Examination of professional selling and the role and mechanisms of sales promotion and advertising in an agricultural environment. Topics include the sales process, promotion, and merchandising devices, media advertising, and display. *Preq:* Junior standing.

352 Public Finance 3(3,0)S Principles of financing government, sources of public revenue, objects of public expenditures, problems of fiscal administration, and the application of fiscal policies in stabilizing the national economy. *Preq:* Junior standing.

402, 602 Production Economics 3(3,0)F Economic analysis of agricultural production involving the concept of the farm as a firm, principles for decision making, the quantitative nature and use of production and cost functions and their interrelations and application of these principles to resource allocation in farms and among areas. *Preq:* AGECE 308 and ECON 314.

403, 603 Land Economics 3(3,0)S Study of the characteristics of land and of the physical, legal, social and economic principles and problems relating to the control and use of land resources. *Preq:* AGECE 202 or ECON 200.

406 Seminar 1(1,0)S Examination of the relation of economics and sociology to specific problems. *Preq:* Senior standing

409, 609 Commodity Futures Markets 3(3,0)F Introduction to the economic theory, organization, and operating principles of agricultural commodity futures markets in the U.S. Emphasis is placed on speculating, hedging, and investing in agricultural commodity futures contracts from the standpoint of the agribusiness entrepreneur. *Preq:* AGECE 202 or ECON 211.

411, 611 (CRD) **Regional Impact Analysis 2(2,0)** See CRD 411.

412, 612 (CRD) **Spatial Competition and Rural Development 2(2,0)** See CRD 412.

413, 613 **Advanced Real Estate Appraisal 3(3,0)** Topics covered include highest and best use analysis, data collection, and analyses. Advanced appraisal procedures for income, cost and comparable sales approach to real estate valuation will be stressed. Eminent domain, the appraisal of property in transition and specialized property will be covered. *Preq:* AGECE 313, FIN 307, or consent of instructor.

420, 620 **World Agricultural Trade 3(3,0)**S Practical considerations of agricultural trade and trade policy analysis are reviewed. The role of international institutions is considered. Special emphasis is placed on concepts of agricultural trade, analysis of trade policies of major trading partners/competitors, and export/import marketing of products. *Preq:* AGECE 309, ECON 412, or consent of instructor.

425, 625 **Aquaculture Economics 3(3,0)**F Alternate years. Application of economics and business principles by firms engaged in fish farming. Basic microeconomic theory is reviewed and applied to aquacultural enterprises. Stress is given to financial management, investment analysis, and marketing management. Public policy affecting aquaculture is also discussed and international aquaculture development reviewed. *Preq:* AGECE 202 and 309 and WFB 350 or consent of instructor.

452, H452, 652 **Agricultural Policy 3(3,0)**F Review of public agricultural policy programs in the United States and a critical examination of current and proposed government policies and programs affecting the agricultural sector of the economy. Included are economic considerations as related to past and current farm price and income problems. *Preq:* AGECE 302 and 309.

456, H456, 656 **Prices 3(3,0)**S Review of the basic theory of price under competitive conditions and various modifications; nature, measurement and causes of daily, seasonal and cyclical price fluctuations; geographical price relationships; nature, function and behavior of futures markets; government price programs. *Preq:* AGECE 308, ECON 314, EXST 462.

460, 660 **Agricultural Finance 3(3,0)**F The study of the principles and techniques of financing in the agricultural sector. Topics include the capital situation in agriculture, concepts of farm financial management, use of credit, capital markets, lending agencies, and estate planning. *Preq:* ACCT 200 or 201, AGECE 202.

491 (CRD) **Internship, Agribusiness, and Community and Rural Development 1-6(0,2-12)** See CRD 491.

719 **Professional Problems in Agribusiness Management 3(3,0)**

791 **Selected Topics in Agricultural Economics 1-3(1-3,0)**

802 **Advanced Production Economics 3(3,0)**

806 **Input-Output Analysis and Regional Structure 2(2,0)**

807 **Market Structure in Agricultural Industries 3(3,0)**

808 **Applied Quantifications in Agricultural Economics 3(3,0)**

809 **Advanced Natural Resource Economics 3(3,0)**

810 **Water and Marine Resources Management and Policy 3(3,0)**

812 **Interregional Competition Analysis 2(2,0)**

814 **Contemporary Public Policy 3(3,0)**

827 **Advanced Agricultural Consumption and Demand 3(3,0)**

851 **Seminar in Research Methodology 1(1,0)**

852 **Research Methods for Agricultural Economists I 2(2,0)**

853 **Research Methods for Agricultural Economists II 2(2,0)**

871 **Workshop in Quantitative Methods in Agricultural Economics 1(1,0)**

872 **Techniques of Survey Analysis in Social Sciences 1(1,0)**

881 **Internship in Community and Resource Development 1-6**

891 **Master's Research. Credit to be arranged.**

901 (ECON) **Price Theory 3(3,0)**

902 (ECON) **Production Economics Problems 2(2,0)**

903 (ECON) General Equilibrium and Welfare Theory 3(3,0)

904 (ECON) Seminar in Resource Economics 3(3,0)

905 (ECON) Advanced Macro Issues 3(3,0)

906 (ECON) Seminar in Area Economic Development 3(3,0)

907 (ECON) Agricultural Marketing Problems 2(2,0)

917 (ECON) Advanced Seminar in Labor Economics 3(3,0)

991 (ECON) Doctoral Research. Credit to be arranged.

AGRICULTURAL EDUCATION (AGED)

Professors: L. H. Blanton, J. H. Daniels, J. A. Hash, R. J. Mercer; G. C. Shinn, *Head*;
Associate Professor: W. A. Shimel

100 Orientation and Field Experience 1(0,2)S Supervised observations and explanations of vocational agriculture teaching while serving as teacher aides. One full week of field experience in representative high schools is required.

201 Introduction to Agricultural Education 3(2,3)F Principles of education, development of agricultural education, and an introduction to the formulation of instructional programs for the teaching of agricultural courses.

300 Supervised Field Experience I 1(0,3) Actual participation in vocational agriculture teaching activities plus conferences with local supervising teachers and college supervisors. One full week of field experiences in specialized high school programs or area vocational centers is required.

400 Supervised Field Experience II 1(0,3)F Special emphasis is placed on filling gaps in existing knowledge and experiences of the students. The primary focus will be on becoming acquainted with the student teaching center well in advance of the customary twelve-week directed teaching experience.

401, 601 Methods in Agricultural Education 3(2,3)F Appropriate methods of teaching vocational agriculture in high schools. The course includes procedures for organizing teaching programs, teaching high school students, and directing F.F.A. activities.

406 Directed Teaching 12(0,36)S Guided participation in the professional responsibilities of a teacher of vocational agriculture including an intensive study of the problems encountered and the competencies developed. Twelve weeks of directed teaching in selected schools are required.
Preq: AGED 400, 401.

407 Internship in Extension Education 6(0,18) Interest and needs of students enrolled will be considered in placing agriculture majors and minors for practical experience. Internship placements may include county extension offices and other appropriate extension units. Six weeks of supervised experience must be completed. *Preq:* AGED 400, senior standing, and consent of instructor at preregistration.

423, 623 Curriculum 2(2,0)S Curriculum goals and related planning for career and continuing education programs.

425, 625 Teaching Agricultural Mechanics 2(1,3)S Organizing course content, conducting and managing an agricultural mechanics laboratory, shop safety, microteaching demonstrations of psychomotor skills, and methods of teaching manipulative abilities.

428, 628 Special Studies in Agricultural Education 1-3(1-3,0) Students are provided with an opportunity to study individually or collectively selected topics and/or problems in agricultural education to meet the particular needs of the clientele enrolled. May be taken twice or for a maximum of six semester hours credit.

430, 630 Fundamentals of Extension Education 2(2,0) Course is designed to introduce students to fundamental philosophy, activities, and methods undergirding the Cooperative Extension Service.
Preq: Consent of instructor.

431, 631 Methods in Environmental Education 3(3,0)SS Study of various techniques appropriate for teaching environmental education. Instruction is applicable to elementary, high school, and adult-level teachers. Offered in Summer School only.

- 432, 632 Visual Media for Agribusiness 3(2,3)** Theoretical and practical course for professionals in agriculture with major emphasis on visual communications.
- 450, 650 Modern Topics and Issues 3(3,0)** A major area of concern to teachers of agriculture and county agents will be selected for intensive study at least one semester prior to offering the course. Team teaching with faculty from other departments in the College of Agricultural Sciences will be utilized when feasible. *Preq:* Senior standing or relevant experience.
- 465, 665 Program and Curriculum Development 3(3,0)F**, Even-numbered years. Each student will determine needs and resources in a specific community and plan a program and curriculum to meet these needs. Instruction is appropriate for agricultural, extension, and vocational personnel.
- 467, 667 Adult Education in Agriculture 3(2,3)S**, Odd-numbered years. Principles and practices appropriate to the solution of problems encountered in instructional programs for adult farmers.
- 480, 680 (COLED, ED, INED) Educational Applications of Microcomputers 3(3,0)** See COLED 480.
- 482, 682 (COLED, ED, INED) Advanced Educational Applications of Microcomputers 3(2,2)** See COLED 482.
- 726 Agricultural Mechanization for Inservice Teachers 3(3,0)**
- 727 Agricultural Education Shop Management 3(1,6)**
- 736 Internship: Teaching 3(1,6)**
- 737 Internship in Agribusiness Firms 3(1,6)**
- 750 Special Institute Course: Selected Topics in Agricultural Education 1-3(1-3,0)**
- 803 Evaluation of Instructional Programs 3(2,3)**
- 804 Special Problems 3(2,3)**
- 805 Administration and Supervision in Agricultural Education 3(3,0)**
- 815 Teaching Agricultural and Power Mechanics 3(2,3)**
- 821 Theories and Practices of Adult Education 3(3,0)**
- 825 Supervision of Student Teaching 3(3,0)**
- 869 Seminar 1-3(1-3,0)**
- 889 (ED, INED) Research in Education 3(3,0)**

AGRICULTURAL ENGINEERING (AGE)

Professors: W. H. Allen, J. M. Bunn, T. H. Garner, R. O. Hegg, *Head:* C. E. Hood, Jr., J. R. Lambert, J. T. Ligon, D. E. Linvill, R. K. White, R. E. Williamson, R. E. Young; *Associate Professors:* D. E. Brune, J. A. Collier, R. B. Dodd, J. C. Hayes; *Assistant Professors:* Y. J. Han, C. L. Weller; *Instructor:* T. R. Garrett

214 Fabrication and Manufacturing Methods for Agricultural Systems 2(1,3) Introduction to machine and structure fabrication for agricultural engineering related disciplines. Topics include metallurgy, arc and gas welding, fasteners, wood fabrication, plastics and protective coatings. *Preq:* EM 201. *Coreq:* EG 209.

221 Surveying for Soil and Water Resources 2(1,3) Fundamentals of land measurement and traverse computations. Surveying practice in traverse and topographic surveys preliminary to design of techniques and construction of structures for resource management. *Preq:* MTHSC 106.

322 Small Watershed Hydrology and Sedimentology 2(1,3) Fundamental relationships governing rainfall disposition are used as bases for defining the hydrology of watersheds. Application of modeling techniques appropriate for runoff and sediment control are emphasized. *Preq:* PHYS 122. *Coreq:* AGRON 202.

333 Environmental Modification and Control for Agricultural and Biological Systems 2(2,0) Principles of environmental modification and control including energy exchange, psychrometrics, heat and moisture balance, biological interactions, control systems and basic elements of heating, ventilation and air conditioning are presented. *Preq:* Junior standing.

350 Microcomputer Controls in Biosystems 2(1,3) Microcomputer interfacing and digital control are studied for application to agriculture, aquaculture, biotechnology and other biosystems. Topics include digital electronic circuits and components, microcomputer architecture and interfacing. *Preq:* ECE 307, ENGR 180, MTHSC 208.

356 Machine Operations for Agricultural and Biological Systems 3(2,3) Concepts of machine operations and machine systems for agricultural and biological applications. Selection, performance evaluation, economic analysis, and maintenance management for individual machines and machine systems. Computer applications for analyzing machine costs and other management factors. *Preq:* EM 201 or PHYS 122.

362 Energy Conversion in Agricultural and Biological Systems 3(2,3) The energy requirements of biological and agricultural systems with emphasis upon direct energy conversion methods. Characteristics of various sources of energy will be considered, including economic aspects. The present energy conversion mechanisms used in agriculture will be studied and their limitations presented. *Preq:* ME 310.

364 Agricultural Waste-Management Systems 2(2,0) The course will include planning and design of waste-management systems which employ physical, biological, and chemical processes for the treatment and utilization of agricultural wastes. Solid, liquid, and gaseous wastes are considered. Presentation is relevant to current agricultural practices and legal and social restraints.

408, 608 (AGRON, ESE) Land Treatment of Wastewater and Sludges 3(3,0) See AGRON 408.

416, 616 Mechanical Design for Agricultural and Biological Systems 3(2,3) Fundamentals of mechanical design with applications to machinery functions relating to soil, plants, and biological products. A design project is performed. *Preq:* EM 304.

421, 621 Engineering Systems for Soil Water Management 2(1,3) Fundamentals of design related to drainage of lands, irrigation and modification of the microenvironment for optimum productivity are presented. *Preq:* MTHSC 208. *Coreq:* EM 320.

428, 628 (CHE) Biochemical Engineering 3(3,0) See CHE 428.

429 Applications in Biotechnology Engineering 3(2,3) Biological growth kinetics and reactor kinetics are applied to demonstrate the principles of ethanol production, cellulose conversion, and anaerobic processes. Integration of food production processes and waste treatment fundamentals of modeling biological processes are studied. Specific biotechnical applications such as plant tissue culture, advances in biosensor and biomechanical systems are analyzed. *Preq:* CHE (AGE) 428.

430, 630 (BIOSC) Bioenergetics for Engineers 4(3,3) Examination of the principal mechanisms of energy capture and transformation in living organisms. Quantitative models of energetic reactions and associated transport processes are developed according to the principles of equilibrium and nonequilibrium thermodynamics. Topics include basic cell biology, photosynthesis, respiration, chemiosmotic, and electron transport. *Preq:* MTHSC 208, BIOCH 301 or consent of instructor. *Coreq:* ME 310 or instruction in thermodynamics.

431, 631 Agricultural Structures and Environmental Design 3(2,3) Analytic design of statically determinant building components with emphasis on wood, steel, and concrete. Specific heating ventilation and air-conditioning systems for animal production are designed. *Preq:* EM 304.

442, 642 Properties and Processing of Biological Products 3(2,3) Study of engineering properties of biological materials and their uniqueness as design restraints on systems for handling, processing and preserving biological products. *Preq:* AGE 333, EM 304, 320, ME 310.

450, 650 Instrumentation for Agricultural and Biological Systems 3(2,3) Overview of modern instrumentation techniques in agricultural and biological engineering systems. Emphasis is on laboratory use of equipment. Topics include performance characteristics of instruments, analog-signal conditioning, transducer theory and applications, and digital systems for data acquisition and control. *Preq:* AGE 350, familiarity with computer programming, or consent of instructor.

451, H451, 651 (ESE, FOR) Newman Seminar and Lecture Series in Natural Resources Engineering 1(0,2) Topics dealing with the development and protection of land, air water, and related resources will be covered by seminar with instructor and by invited lecturers. Current environmental and/or resource conservation issues will be addressed. *Preq:* Senior or graduate standing, consent of instructor.

452, 652 (ME) Safety Engineering 3(3,0) See ME 452.

471 Engineering Research and Management 2(1,3) A research project is conducted on an agricultural and biological engineering problem. Engineering economics, engineering creativity and proj-

ect management are incorporated in addition to communications skills. *Preq:* Senior standing in Agricultural Engineering or other engineering curricula.

473, H473 Special Topics in Agricultural Engineering 3(3,0) Comprehensive study of special topics in the field of agricultural engineering not covered in other courses. Special emphasis will be placed on independent pursuit of detailed investigations.

781 Special Problems 1-3

811 Tillage and Soil Dynamics 3(3,0)

822 Water Movement in Soils 3(3,0)

865 Heat and Moisture Transfer in Biological Materials 3(3,0)

871 Selected Topics in Agricultural Engineering 1-3

882 Systems Engineering 3(3,0)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

AGRICULTURAL MECHANIZATION (AGM)

Professors: W. H. Allen, J. M. Bunn, T. H. Garner, R. O. Hegg, C. E. Hood, Jr., J. R. Lambert, J. T. Ligon, D. E. Linvill, R. K. White, R. E. Williamson, R. E. Young; *Associate Professors:* D. E. Brune, J. A. Collier, R. B. Dodd, J. C. Hayes; *Assistant Professors:* Y. J. Han, C. L. Weller; *Instructor:* T. R. Garrett

205 Principles of Farm Shop 3(2,3) Principles, techniques, and methods in the selection, proper use and maintenance of hand and power tools. Principal topics include welding, tool fitting, metalwork, woodworking, finishing and preserving, pipe fitting, and farm masonry.

206 Agricultural Mechanization 3(2,3) The agricultural student is taught to apply physical principles and sound reasoning to the mechanization of modern agricultural production and processing enterprises. Planning efficient operational systems and wise selection of equipment, based on function and economic suitability are stressed. *Preq:* MTHSC 105, PHYS 207 or consent of instructor.

301 Soil and Water Conservation 3(2,3) Water management in agriculture is studied by applying principles of elementary surveying, mathematics and fluid flow as related to soil-water-vegetation complexes in erosion control, conservation, drainage, and irrigation.

302 Rainfall, Runoff, and Erosion Control 3(2,3) Precipitation causes, characteristics and distribution are covered. Resulting runoff rates and volumes as influenced by watershed characteristics are studied, including methods of controlling runoff and erosion by vegetative and mechanical means. Sufficient elementary surveying is included to assure proper application of principles in the design of soil and water conservation practices. Not open to students who have completed AGM 301.

303 Calculations for Mechanized Agriculture 3(2,3) Course designed to enhance the student's ability to analyze and solve a wide range of problems requiring engineering technology. Laboratory periods will be used to introduce the student to microcomputer hardware. Basic programming, and typical applications to agricultural mechanization problems. *Preq:* PHYS 207 or consent of instructor.

402, 602 Drainage, Irrigation, and Waste Management 3(2,3) Continuation of AGM 302. Basic soil-water-plant relationships are used to determine the need for and methods of irrigation, drainage, and waste management. Topics covered will include irrigation methods, drainage needs, drainage methods, and waste-treatment methods. *Preq:* AGM 302.

404, 604 Farm Structures 3(2,3) Farmstead planning, including space and environmental needs for livestock and poultry. Design of building components and environmental control. *Preq:* PHYS 207 or consent of instructor.

406, 606 Mechanical and Hydraulic Systems 3(2,3) This course deals with power transmission systems for agricultural production with emphasis on mobile equipment. The characteristics, requirements, and design of both V-belt drive and roller-chain drives are presented. Emphasis is placed on hydraulic power transmission systems, including pumps, actuators, control devices, and hydraulic circuitry. *Preq:* AGM 206, PHYS 207 or consent of instructor.

408 Equipment Sales and Service 3(3,0) Agricultural equipment sales and service techniques, inventory and accounting procedures followed by the farm machinery industry.

452, 652 Farm Power 3(2,3) A study of tractors with emphasis upon internal combustion engine principles and the support systems necessary for its proper functioning. The application of power, maintenance, adjustment, and general repair are also considered. *Preq:* PHYS 207 or consent of instructor.

460, 660 Farm and Home Utilities 3(2,3) A course for undergraduate and graduate students in agriculture and related curricula, involving a study of electric and other utilities on the farm and in the home. Selection, installation, and maintenance of wiring systems, lighting systems, motors, controls, water systems, and waste disposal systems are emphasized. *Preq:* PHYS 208 or consent of instructor, Junior standing.

472 Seminar 1(1,0) The student will be introduced to the agribusiness world, professionalism, current topics of special interest, and financial and legal implications of modern agricultural production. *Preq:* Senior standing in Agricultural Mechanization and Business or consent of instructor.

712 Farm Machinery Management 3(2,3)

771 Selected Topics in Agricultural Mechanization 1-3(1-3,0)

781 Special Problems 1-3(1-3,0)

851 Simulation of Agricultural Systems 3(3,0)

AGRICULTURE (AGRIC)

Professors: G. P. Birrenkott, Jr., J. H. Daniels, O. J. Dickerson, J. R. Diehl, R. E. Franklin, B. Glick, R. G. Halfacre, H. S. Hill, Jr., L. W. Hudson, D. D. Lee, R. D. Lineberger, D. E. Linvill, E. L. McLean, R. J. Mercer, R. E. Williamson; *Associate Professors:* J. C. McConnell, Jr., S. U. Wallace; *Assistant Professors:* M. A. Hall, M. E. Richardson

103 Introduction to Animal Industries 3(3,0)F Fundamental and descriptive aspects of the animal industries as applied biology and major segments of food production and distribution systems. The subject matter will be presented by Animal Science, Dairy Science, and Poultry Science Departments.

104, H104 Introduction to Plant Sciences 3(3,0)S A fundamental course in plant sciences, including agronomic and horticultural crops of the major agricultural areas of the world and emphasizing the crops of South Carolina.

105 Agriculture and Society 2(2,0) Examination of the structure, function, and importance of the food and resource base, production, supply, marketing, demand, capital, labor markets, and consumption behavior in the U.S. economic and sociological issues affecting U.S. agriculture.

200 Agricultural Applications of Microcomputers 3(2,2) Provides an overview of microcomputer hardware and software encompassing wordprocessing, spreadsheet, data base management, utility, and communications. It also includes specialized farm and agribusiness management and decision-making programs and criteria for evaluating and selecting hardware.

301 International Agriculture 3(3,0) Designed to acquaint the student with the systems of agriculture of the world. The approach is evolutionary. Main emphasis is on production as related to world climates and world population. Various geographical areas are considered. *Preq:* AGECE 202 or ECON 211.

401 International Agriculture Seminar 1(1,0)S A colloquium of current issues in world agriculture. Topics include population growth, food policy, technology transfer, and international trade. With consent of instructor, the course may be repeated for a total of two credits.

440, 640 Microclimatology 3(3,0) Study of energy balance in earth's atmosphere and soil: solar and thermal radiation, air and soil temperature, humidity, evaporation and the hydrologic cycle, wind fields. Weather variables to describe microclimates and the energy balance of plants, animals, and insects. Modification of microclimates. Rural and urban climates. *Preq:* PHYS 240 or equivalent or consent of instructor; second semester Junior or Senior standing.

H491 Senior Honors Research 3(1,6) Senior Division Honors research in an agricultural sciences curriculum. Open to approved Honors Program students only. In consultation with and under the direction of a professor, the student will select a research topic, conduct experiments, record data, and make an oral presentation of results to the College Honors Program Committee.

H492 Senior Honors Research 3(1,6) Continuation of AGRIC H491. Senior Division Honors research in an agricultural sciences curriculum. Upon termination of the research project, the student will submit a formal written report and make a final oral presentation of results to the College Honors Program Committee. Professor-student discussions of additional topics will be arranged.

AGRONOMY (AGRON)

Professors: R. E. Franklin, *Head*; B. J. Gossett, W. D. Graham, Jr., J. A. Martini, J. H. Palmer, C. L. Parks, V. L. Quisenberry, J. S. Rice, H. D. Skipper; *Associate Professors:* E. C. Murdock, E. R. Shipe, B. R. Smith, W. C. Stringer, S. U. Wallace, T. Whitwell; *Assistant Professors:* A. Evans, Jr., N. W. Ferguson, B. W. Pinkerton

202 Soils 4(3,2)F,S Introduction to world land resources, soil formation, classification, and mineralogy. Emphasis is placed on the basic chemical and physical properties of soil. Soil microorganisms, plant nutrients, and fertilization are discussed. Soil properties are related to growth. *Preq:* CH 101, 102, or a geology sequence including GEOL 101, or consent of instructor.

350 Practicum 1-3 Preplanned internship undertaken with an approved agency concerned with agronomic practices. Restricted to students with a major or minor in Agronomy. Maximum of three credits allowed. *Preq:* Consent of department head.

403, 603 Soil Genesis and Classification 2(1,3)F Study of soil morphology and characterization, pedogenic processes, soil-forming factors, and classification of soils. *Preq:* AGRON 202 or consent of instructor.

404, 604 Soils and Land Use 2(1,3)F Soils interpretations for nonagricultural purposes and facilities. Emphasis on use of modern soil surveys and properties and features of soils important in nonfarm land uses. Not open to Agronomy majors or minors or to students who have had AGRON 202.

405, 605 Plant Breeding 3(2,2)S The application of genetic principles to the development of improved crop plants. Principal topics include the genetic and cytogenetic basis of plant breeding, mode of reproduction, techniques in selfing and crossing, methods of breeding, inheritance in the major crops, and biometrical methods. *Preq:* GEN 302 or equivalent.

406 Special Problems 1-2(0,3-6) Course designed to acquaint undergraduate students with the scientific method. Literature investigation, planning, and execution of an experiment are integral parts of the course. Not available to AGRIC H491 and H492 students. Maximum of 4 credits allowed. *Preq:* Senior standing as a major or minor in Agronomy and consent of department head.

407, H407, 607 Principles of Weed Control 3(2,2)F Weeds, their introduction, ecology, methods of reproduction, dissemination, and control; chemistry and mode of action of herbicides, equipment and techniques of application; a characterization of the common weeds of the Southeast. Admission to honors section by invitation only. *Preq:* AGRIC 104, AGRON 202, or consent of instructor.

408, 608 (AGE, ESE) Land Treatment of Wastewater and Sludges 3(3,0)S Principles for designing environmentally acceptable land application systems using municipal and industrial wastewater and sludges will be presented. Topics include land-limiting constituent analysis; soil-plant interactions; system equipment and design; system operation and management; public acceptance, social, and regulatory issues. Case studies and field trip(s) are planned. *Preq:* Senior standing in Agriculture or Engineering or consent of instructor.

421, 621 Field Crops—Monocots and Specialty Crops 3(3,0)F The principles involved in the production and utilization of corn, wheat, oats, barley, rye, sorghum, rice, and the millets, with special emphasis on their importance in South Carolina agriculture. The role of other oil, fiber, seed, drug, sugar, and other crops will be treated from the standpoint of worldwide production and utilization. *Preq:* AGRIC 104, AGRON 202.

422, 622 Field Crops—Dicots 3(3,0)S The principles involved in the production and utilization of corn, soybeans, tobacco, and peanuts with special emphasis on their importance in South Carolina agriculture. *Preq:* AGRIC 104, AGRON 202.

423, H423, 623 Field Crops—Forages 3(3,0)S The characteristics, establishment, utilization, and maintenance of crops for hay, silage, and pasture. Crops valuable in South Carolina are emphasized. Admission to Honors section by invitation only. *Preq:* AGRIC 104, AGRON 202, or consent of instructor.

424, 624 Advanced Field Crops Laboratory 1(0,2)F Identification and management of the important forage and row crops of the Southeast, nation, and the world. *Preq:* AGRIC 104.

425, 625 Seed Science and Technology 3(2,2)S Odd-numbered years. Topics include seed development, germination, dormancy, pathology, storage, and deterioration. Seed testing and commercial production of seed are also covered. Emphasis will be placed on useful applications of current seed science knowledge. *Preq:* AGRIC 104, BOT 205.

433, 633 (HORT) Integrated Weed Management for Agronomic and Horticultural Crops 3(2,2) See HORT 433.

446, 646 Soil Management 3(3,0)F Basic soil properties are related to compaction, water and solute movement, and root growth. Practical management problems are considered and solutions developed based upon basic soil characteristics. Problems will include erosion, no-tillage, compaction, irrigation, leaching, waste application, golf-green management, and orchard establishment. *Preq:* AGRON 202.

452, 652 Soil Fertility and Management 3(3,0)S Soil properties, climatic factors, and management systems in relation to soil fertility maintenance for crop production. Plant nutrition and growth in relation to crop fertilization and management. *Preq:* AGRON 202 or consent of instructor.

453, H453, 653 Soil Fertility Laboratory 1(0,3)S The evaluation and interpretation of soil fertility production. *Preq:* AGRON 202 or consent of instructor.

455 Seminar 1(1,0)F Student presentation of current agronomic topics of special interest in crop production appearing in recent scientific journals and other publications.

456 Seminar 1(1,0)S Student presentation of current topics of special interest in the field of soil science appearing in recent scientific journals and other publications.

475, H475, 675 Soil Physics and Chemistry 3(2,3)S Study of the principles of soil physics and chemistry and their applications. Topics include soil texture, structure, compaction, water relations, solute movement, mineral composition, adsorption phenomenon, and soil acidity. *Preq:* AGRON 202, CH 101, 112, PHYS 207.

490, 690 Soil Organisms in Crop Production 3(2,3)F Even-numbered years. Interrelationships of soil organisms, soil properties, and crop production. Aspects of biological nitrogen fixation, mycorrhizae, and microbial-pesticide interactions. Biochemical and nutrient transformations related to plant growth. *Preq:* AGRON 202, MICRO 305, PLPA 301, or consent of instructor.

701 Soils and Man 3(3,0)

710 Selected Topics in Plant Biotechnology 3(2,2)

801 Crop Physiology and Nutrition 3(3,0)

802 Pedology 3(3,0)

804 Theory and Methods of Plant Breeding 3(3,0)

805 Soil Fertility 3(3,0)

806 Special Problems 1-3(0,3-9)

807 Soil Physics 4(3,3)

808 Soil Chemistry 3(2,3)

810 Soil Microbiology 3(3,0)

812 Crop Ecology and Land Use 3(3,0)

820 Pesticide Residues in the Environment 3(3,0)

825 Seminar 1(1,0)

890 Special Topics in Agronomy 1-3(1-3,0)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

AMERICAN STUDIES (AMST)

Assistant Professor: W. Lasser

300 American Culture 3(3,0) Examination of the major works in the field of American studies, emphasizing the genesis, growth, and varied nature of interdisciplinary American writing in the last fifty years. *Preq:* Sophomore standing.

400 Topics in American Studies 3(3,0) Study of selected issues or concerns in American life from an interdisciplinary point of view. *Preq:* Sophomore standing.

ANIMAL PHYSIOLOGY (ANPH)

(See courses listed under Animal Science, Dairy Science, Entomology, Poultry Science, and Zoology)

Professors: G. P. Birrenkott, Jr., J. F. Dickey, J. R. Diehl, C. W. Foley, T. Gimenez, B. Glick, D. M. Henricks, B. L. Hughes, J. C. Spitzer, R. J. Thurston; *Associate Professors:* J. M. Colacino, J. R. Tomasso, Jr.; *Assistant Professors:* M. E. Richardson, T. R. Scott

301 Physiology and Anatomy of Domestic Animals 4 (3,3)S Physiology and associated anatomy of the body systems, including nervous, skeletal, muscular, respiratory, digestive, circulatory, urinary, reproductive, and endocrine systems. Designed primarily for students in Animal Science; Dairy Science; Poultry Science; and Aquaculture, Fisheries, and Wildlife Biology. *Preq.* BIOL 103, 104, 105, 106 or 110, 111

460, H460, 660 Systems Physiology 1(1,0)F Physiology of the digestive and endocrine systems. *Coreq:* ZOOL 459 or consent of instructor.

801 Electron Microscopy of Biological Specimens 3(1,6)

802 Special Topics in Animal Physiology 1(1,0)

806 Experimental Animal Physiology 3(1,6)

807 Special Problems in Animal Physiology 1-3

808 Current Concepts in Endocrinology 3(3,0)

812 Digestive-Metabolic, Excretory and Respiratory Physiology 5(4,3)

814 Membrane, Cardiovascular and Neuro-Muscular Physiology 5(4,3)

851 Animal Physiology Seminar 1(1,0)

991 Doctoral Research. Credit to be arranged.

ANIMAL SCIENCE (ANSC)

Professors: D. L. Cross, J. R. Diehl, C. W. Foley, *Head;* T. Gimenez, D. M. Henricks, L. W. Hudson, G. C. Skelley, Jr., J. C. Spitzer, C. E. Thompson; *Associate Professors:* D. L. Handlin, J. C. McConnell, Jr.; *Assistant Professor:* T. C. Jenkins

108 Animal Science Techniques I 1(0,2)S Basic principles in the handling of livestock and techniques of animal industries are discussed. Basics of animal anatomy, and equipment and facilities used in animal production are presented.

202 Introductory Animal Science 3(3,0)F Systematic coverage of the basic principles involved in the breeding, feeding, management, and marketing of beef cattle, swine, sheep, and horses.

205 Light Horse Management 2(1,3)F The light horse industry—development of breeds and their uses. Breeding, feeding, and management of light horses. Fundamental instruction in equitation.

210 Animal Science Techniques II 1(0,2)F Continuation of ANSC 108. Livestock handling techniques used in the animal industry are discussed. Principles of animal care and management for livestock production are emphasized. *Preq:* AGRIC 103 or ANSC 202; and ANSC 108.

253 Meats 2(2,0)S Study of the chemical and physical composition of meat, meat hygiene, nutritive value, curing, freezing, and meat by-products.

255 Meats Laboratory 1(0,3)S The selection and grading of meat animals and carcasses. Practical work in slaughtering of animals and in the cutting, curing, and freezing of meats. Emphasis is placed on the identification of wholesale and retail cuts.

301, H301 Feeds and Feeding 3(3,0)F Feeds, nutrients, digestion, metabolism of feedstuffs, feeding standards, and balancing of rations. *Preq:* AGRIC 103 or ANSC 202 or consent of instructor.

302 Principles of Livestock Selection 2(1,2)S Pedigrees, performance records, and visual appraisal techniques will be integrated to teach students to identify livestock to be kept for breeding purposes. Students enrolled in the course are eligible to compete in intercollegiate selection contests. *Preq:* ANSC 202 or consent of instructor.

303 Livestock Evaluation 2(1,2)F Modern selection parameters are integrated with visual appraisal in the identification of body traits that will ultimately affect the market grades and economic value of live animals and their carcasses. *Preq:* AGRIC 103 or ANSC 202 or consent of instructor.

305 Meat Grading and Selection 2(1,3)F Classification, grading and selection of beef, lamb and pork carcasses, and wholesale cuts; and factors influencing quality and value will be studied. Students enrolled in this course are eligible to compete in intercollegiate meat-judging contests. *Preq:* ANSC 202.

309 Principles of Equine Evaluation 2(0,4) Study of conformation as it relates to locomotion, soundness, and breed standards are taught. Included are the rules and regulations of performance events and appropriate management of these events. Considerable time will be spent judging classes and delivering oral reasons. *Preq:* ANSC 205 or consent of instructor.

310 Animal Disease and Sanitation 3(3,0)S Basic principles of animal health. The course emphasizes disease prevention in beef cattle, dairy cattle, goats, horses, poultry, and swine. The most common and important diseases and zoonoses of farm animals are explained. *Preq:* ANSC 202 or consent of instructor.

360 Animal Science Internship 1-6(0,2-12) Preplanned internship under competent supervision in an approved agency concerned with Animal Science endeavors. The student will submit periodic reports and conduct a seminar. *Preq:* Junior standing in Animal Science and consent of instructor.

365 Biology of Muscle Growth 2(2,0)F Study of the histology, biochemistry, and physiology of animal muscle, fat, and bone tissue with emphasis on increasing muscle growth. *Preq:* ANSC 253, 255.

380 Meat Technology and Fabrication 3(2,3)F Basic composition, chemistry, and utility of meat products with emphasis on sausages and restructured portion control items will be discussed. *Preq:* ANSC 253 and 255.

401, H401, 601 Beef Production 4(3,2)F Breeding, feeding, reproduction and management of beef cattle will be discussed. Emphasis is on production systems integrating disciplines of animal agriculture into management plans and alternatives. Practical applications of beef production and management practices will also be presented. *Preq:* ANSC 301, DYSC 453; NUTR 401 or consent of instructor.

405 Advanced Livestock Selection and Evaluation 2(0,4)F Class intended to provide special training in selection and evaluation of breeding and market animals. Species being dealt with are cattle, sheep, and swine. Intended to prepare students for participation in intercollegiate livestock judging contests. *Preq:* ANSC 302.

406 Seminar and Related Topics 2(2,0) A Two-part study designed to (1) aid in resume preparation, introduction to interviewing skills, and acquaint students with industry's expectations of Animal Science graduates; and (2) provide opportunity to prepare and orally deliver technical information. *Preq:* SPCH 250 or consent of instructor.

408, H408, 608 Pork Production 4(3,2)S Breeding, feeding, grading, marketing, and management of swine will be studied. Practical applications from all phases of the production cycle will be outlined in problem form to develop the student's problem-solving ability. *Preq:* ANSC 301, DYSC 453; NUTR 401 or consent of instructor.

412, H412 Horse Production 4(3,2)S Feeding, breeding, and management of the horse discussed in relation to health, genetics, reproduction, nutrition, and selection. *Preq:* ANSC 301, DYSC 453; NUTR 401 or consent of instructor.

422 Special Problems 1-3(0,3-9) Topics of interest to the student during the junior or senior year. The course will give experience with livestock problems not covered in other courses. *Preq:* Junior or Senior standing, consent of department head and instructor.

452, H452, 652 Animal Breeding 3(3,0) The fundamental principles relating to the breeding and improvement of livestock including variation, heredity, selection, linebreeding, inbreeding, cross-breeding, and other related subjects. *Preq:* GEN 302.

802 Topical Problems 1-3(1-3,0)

803 Meat Technology 3(3,0)

804 Methods in Animal Breeding 3(3,0)

805 Nutrition of Meat Animals 3(3,0)

891 Master's Research. Credit to be arranged.

ANTHROPOLOGY (ANTH)

Assistant Professor: J. M. Coggeshall

110 Physical Anthropology 4(3,2) Studies humans as a biological organisms. Examines human evolution, including current controversies; primate social behavior and relationships to humans; and racial and physiological differences among contemporary human populations. (Some biology recommended; e.g., BIOL 103.)

201 Introduction to Anthropology 3(3,0) Humans as biosocial animals, including the theory of evolution and the archaeological evidence of physical and cultural development; emphasis on the relation of human beings to the environment.

301 Cultural Anthropology 3(3,0) The nature of human culture; the constants and variants in human behavior affecting technology, social relations, social control, family systems, language, religion and art. *Preq:* ANTH 201 or consent of instructor.

310 Archaeology of the Southeastern American Indians 3(3,0) The cultural prehistory of the Southeastern United States, including developments in each time period: evidence of intra- and inter-regional trade, agriculture, and societal complexity. *Preq:* ANTH 201 or consent of instructor.

320 North American Indian Cultures 3(3,0) American Indian ethnography, using the culture area approach in studying adaptations of native peoples; includes a brief survey of American Indians today. *Preq:* ANTH 201 or consent of instructor.

ARCHITECTURAL STUDIES

ARCHITECTURE (CAAR)

Professors: J. F. Barker, D. L. Collins, M. A. Davis, T. K. Doruk, J. D. Jacques, *Head:* Y. Kishimoto, P. R. Lee, R. B. Norman, K. J. Russo, G. B. Witherspoon, J. L. Young; *Associate Professors:* L. G. Craig, R. D. Eflin, R. J. Hogan, N. J. Hurt, D. J. Hutton, G. W. Patterson, G. M. Polk, Jr.; *Assistant Professor:* R. T. Huff; *Visiting Associate Professor:* H. C. Harritos; *Visiting Assistant Professors:* R. D. Crout, Jr., L. C. LeBlanc, W. K. Powers, M. H. Rice, R. T. Silance; *Adjunct Professor:* F. G. Roth

201 The Art of Architecture 3(0,6) Examines basic concepts of architectural design from historical models to contemporary examples. Seminar discussions complement studio exercises and projects which concentrate on principles of design, materials of construction, programmatic concerns, and design theories. *Preq:* CADS 151 and 153; 152 and 154.

202 Art with Architecture 3(0,6) Course will emphasize the integration of art with architecture. Seminar discussions and field trips examine key examples from the past and present. Studio projects and exercises utilize the principles of design to creatively solve design problems of art in public places. *Preq:* CAAR 201.

351 Design Studies in Architecture V 6(0,14) Studio work with adjunct demonstrations and lectures concerned with intermediate architectural design problems. *Preq:* CADS 252, 254.

352 Design Studies in Architecture VI 6(0,14) Continuation of CAAR 351. *Preq:* CAAR 351.

403, 603 The Modern Architectural Movement 3(3,0) Seminar in the analysis and criticism of architectural and town building works. The course sequence will include historic and contemporary examples, literary searches, field trips, essays, and oral reports. *Preq:* Senior standing or consent of instructor.

- 404, 604 Current Directions in Architecture 3(3,0)** The critical analysis of the development and current directions of modern movements in architecture. *Preq:* Senior standing or consent of instructor.
- 412, 612 Architectural History Research 3(3,0)** Directed investigations related to the art and architectural heritage of Italy.
- 414, 614 Design Seminar 3(3,0)** Exploration of topical issues in architecture, art, construction, and planning.
- 416, 616 Field Studies in Architecture and Related Arts 3(0,9)** Documentation and analysis of architectural structures observed during European travels in graphic and written form.
- 421 Architectural Seminar 3(3,0)** Lectures and seminars dealing with pertinent topics related to environmental and technological considerations in architecture and the building industry. *Preq:* Senior standing or consent of instructor.
- 424, 624 Product Design 3(0,9)** Furniture and product system design with emphasis on ergonomics and the relationship of form and materials. *Preq:* Senior standing and consent of instructor.
- 425, 625 Energy in Architecture 3(3,0)** Climate design methodology and its influence on building energy patterns and architectural form. *Preq:* Senior standing and consent of instructor.
- 426, 626 Architectural Color Graphics 3(2,3)** Architectural color graphics by computer. Theories of color classification and interaction; application of color theories to art and architecture. *Preq:* Consent of instructor.
- 428, 628 Computer-Aided Design 3(2,3)** Introduction to the concepts, skills and applications of computer-aided design as they relate to the practice of architecture. *Preq:* Senior standing or approval of instructor.
- 451 Design Studies VII 6(0,14)** Studio work with adjunct seminar/lecture concerned with advanced architectural design problems. *Preq:* CAAR 352.
- 452 Design Studies VIII 6(0,14)** Continuation of CAAR 451. *Preq:* CAAR 451.
- 481, 681 Architectural Office Practice 3(3,0)** Examination of ethical, legal, and business issues in the architectural professions. *Preq:* Professional degree program status.
- 485, 685 Health Care Facilities Systems 3(3,0)** Course introduces the concepts, organization, and direction of health and health-care services within the context of health-care delivery systems. Special emphasis is placed on mental and physical health-care facilities concepts. *Preq:* Consent of instructor.
- 488, 688 Health Care Facilities Programming Techniques 3(3,0)** Seminar on recent research and innovations in health-care facilities programming and original investigation of assigned programming problems. *Preq:* Consent of instructor.
- 490, H490 Directed Studies 1-5** Comprehensive studies and research of special topics not covered in other courses. Emphasis will be placed on field studies, research activities, and current developments in architecture. *Preq:* Consent of department head.
- 557 Architecture Studio 6(0,18)** City planning design and the development of complex building solutions.
- 558 Architecture Studio 6(0,18)** Programming and solution of complex building design problems including interior and site development. *Preq:* CAAR 557.
- 801 Architecture Seminar 3(3,0)**
- 802 Phenomenology of Architecture 3(3,0)**
- 803 Theories of Architecture 3(3,0)**
- 804 Modern Masters 3(3,0)**
- 805 Architecture and the City 3(3,0)**
- 850 Architecture Studio 6(0,18)**
- 853 Architecture Studio 6(0,18)**
- 854 Architecture Studio 6(0,18)**
- 857 Architecture Studio 6(0,18)**
- 858 Thesis Research 3(0,9)**

859 Thesis Manuscript 3(0,9)

886 Health Care Components 3(3,0)

890 Directed Studies 1-5(1-5, 0)

891 Thesis Project 3-9(0,9-27)

ARCHITECTURE OVERSEAS PROGRAM (CAGE)

(See courses listed under each field of study.)

Professor: C. Fera, *Director:* J. L. Young, *Professor-in-Residence*

The Daniel Center for Urban Studies in Genoa, Italy, is available to qualified Master of Architecture, Building Science and Management, Master of Fine Arts, and Master of City and Regional Planning students. Studio and classroom work in this historic port setting is enriched by visiting scholars and complemented by scheduled field trips, both in Italy and continental Europe.

ART AND ARCHITECTURAL HISTORY (CAAH)

Professor: E. C. Voelker; *Associate Professors:* J. B. LeBlanc, G. L. Walker; *Visiting Assistant Professor:* L. K. Varkonda; *Adjunct Professor:* H. N. Cooledge

101, H101 Survey of Art and Architectural History I 3(3,0) Survey of architectural design and the decorative arts, landscape and building technology, in the Ancient Near East, Egypt, Greece, Rome, Byzantium, as well as Romanesque and Gothic Europe.

102, H102 Survey of Art and Architectural History II 3(3,0) Survey of Renaissance, Baroque and Neoclassical art and architecture. Introduction to the Modern Movement in Europe and America. *Preq:* CAAH 101.

203, H203 History and Theory of Architecture I 3(3,0) First of a two-semester sequence of special topics and issues in the history of architecture. Emphasis on architectural theory and practice in the past and present. Analysis of differing approaches to history: chronological, typological, thematic, phenomenological. *Preq:* CAAH 102.

204, H204 History and Theory of Architecture II 3(3,0) Second of a two-semester sequence on special topics and issues in the history of architecture. Emphasis on typologies of the house, governmental buildings, and sacred architecture. New directions in architectural historiography. *Preq:* CAAH 203.

205, H205 History and Theory of Art I 3(3,0) First of a two-semester sequence on special topics and issues in the history of art. Emphasis on stylistic developments and specific art movements. Analysis of art within the larger context of social, political, religious history. Examination of art techniques and theory as they have developed. *Preq:* CAAH 102.

206, H206 History and Theory of Art II 3(3,0) Second of a two-semester sequence on special topics and issues in the history of art. Continued emphasis on stylistic developments and art movements, with specific attention directed toward post-Renaissance art. Analysis of the influence of past history on modern. *Preq:* CAAH 205.

215 History of Art and Architecture III 3(3,0) Through the spring 1990. Cultural focus: its problems and expression as evidenced by selected examples of architecture and planning from ancient times to the present, considered in depth.

216 History of Art and Architecture IV 3(3,0) Through the spring 1990. Continuation of CAAH 215.

305 Contemporary Art History 3(3,0) Study of contemporary art from World War II to the present, exploring the forces that have shaped the various movements and directions. *Preq:* CAAH 203.

310 Evolution of the Visual Arts 3(3,0) A one-semester survey course designed to meet the needs of the students outside the College of Architecture. Emphasis on a chronological survey of the major styles of the visual arts from prehistory to the modern age, including examination of major artistic figures from the representative periods. Not open to College of Architecture majors.

391 Italian Studies Abroad 6(12,0)SS On-site exposure of specific art works and architectural monuments. Study of museum collections and historic structures. Lectures scheduled in Milan, Veneto area Venice, Ravenna, Rimini, Ancona; Split, Yugoslavia; return to Italy via Bari; Greek ruins at Paestum, Pompeii, Rome and environs, Florence and environs, Genoa and environs. Offered pass/fail only. *Preq:* CAAH 204 or 206.

411, 611 Directed Research in Art and Architectural History 3(3,0) Comprehensive studies and research of special topics not covered in other courses. Emphasis will be placed on field studies, research activities, and current developments in art history.

412, 612 Directed Research in Art and Architectural History 3(3,0) Continuation of CAAH 411.

413, 613 Twentieth Century Visual Arts 3(3,0) Consideration of the visual arts in the 20th century in relation to the factors that have influenced the artists and the consequence of their production to society.

416 History of Landscape Architecture 3(3,0) Planetary survey of notable examples of mankind's constant efforts to arrange and bring order to his environment by design on the land. *Preq:* Junior standing or consent of instructor.

417, 617 Studies in the Art and Architecture of the Ancient World I 3(3,0) Consideration of the visual arts and architectural monuments of the Ancient World (Egypt, the Near East, Greece, and Rome) with a study in depth of selected examples from the period. *Preq:* CAAH 204 or 206 or consent of instructor.

418, 618 Studies in the Art and Architecture of the Ancient World II 3(3,0) Consideration of the visual arts and architectural monuments of the Ancient World (Egypt, the Near East, Greece, and Rome), with a study in depth of selected examples from the period. *Preq:* CAAH 417.

419, 619 Studies in the Art and Architecture of the Early Middle Ages 3(3,0) Consideration of the visual arts and architectural monuments of the Early Middle Ages (Byzantium and Western Europe from the 4th through 12th centuries), with a study in depth of selected examples from the period. *Preq:* CAAH 204 or 206 or consent of instructor.

420, 620 Studies in the Art and Architecture of the Late Middle Ages 3(3,0) Consideration of the visual arts and architectural monuments of the Late Middle Ages (Western Europe from the 12th through the 15th centuries), with a study in depth of selected examples from the period. *Preq:* CAAH 419.

423, 623 Studies in the Art and Architecture of the Renaissance I 3(3,0) Consideration of the visual arts and architectural monuments of the Renaissance (Western Europe from the 15th through the 18th centuries), with a study in depth of selected examples from the period. *Preq:* CAAH 204 or 206 or consent of instructor.

424, 624 Studies in the Art and Architecture of the Renaissance II 3(3,0) Consideration of the visual arts and architectural monuments of the Renaissance (Western Europe from the 15th through the 18th centuries), with a study in depth of selected examples from the period. *Preq:* CAAH 423.

425, 625 Architecture of the Technical Revolution 1685-1865 3(3,0) Consideration, in depth and particular, of the impact on architecture of the applied scientific method as it produced mechanical inventions, new construction material and methods, new power sources and production technique, and the social adjustments which all of these initiated. *Preq:* CAAH 204 or 206 or consent of instructor.

427, 627 Eighteenth Century Visual Arts 3(3,0) Consideration of the visual arts: sculpture, painting, graphics, and furnishings of the 18th century in its environment, together with its precursors and later influence (1785-1815). *Preq:* CAAH 204 or 206.

428, 628 Nineteenth Century Visual Arts 3(3,0) Consideration of the visual arts of the 19th century: painting, sculpture, printmaking, ceramics, and so forth, in relation to the factors that have influenced the artist and the consequence on society. *Preq:* CAAH 427.

429, 629 Studies in the Art and Architecture of India and the Far East 3(3,0) Consideration of the visual arts and architectural monuments of India and the Far East, with a study in depth of selected examples from the period. *Preq:* CAAH 204 or 206 or consent of instructor.

815 Art and Architectural History Seminar I 3(3,0)

816 Art and Architectural History Seminar II 3(3,0)

BUILDING SCIENCE (CABS)

Professors: C. L. Addison, N. L. Book, L. H. Brown, R. W. Liska, *Head*; *Associate Professors:* M. D. Egan, F. M. Eubanks, S. D. Schuette; *Visiting Assistant Professors:* G. R. Corley, J. M. Mumford; *Adjunct Professor:* R. E. Knowland

201 Structures I 3(3,0) Study of statically determinate structures including force applications and distributions in structural elements and the resulting stress-strain patterns in axial, shear and bearing mechanisms. *Preq:* MTHSC 102 or 106.

202 Structures II 3(3,0) Study of the force distribution in statically determinate structures and structural elements including moment and shear stress, combined loading/stress conditions and deflections. *Preq:* CABS 201.

203 Materials and Methods of Construction 3(3,0) Theory and principles of building construction with an overview of how the major components of a building fit together and the rationale behind their construction. *Preq:* Sophomore standing.

204 Contract Documents 3(2,3) Introduction to working drawings, specifications, and the various documents required to carry out a typical construction project. *Preq:* CABS 203.

301 Structures III 3(3,0) Theory, analysis, and design of statically determinate steel and wood-structural components and systems; and introduction to reinforced concrete and reinforced masonry structures and systems. *Preq:* CABS 202.

302 Structures IV 3(3,0) Theory, analysis and design of statically indeterminate steel, wood, and reinforced concrete structural components and systems and related structural concepts. *Preq:* CABS 301.

303 Soils and Foundations 3(2,3) Various types of soil will be studied, including related activities of testing, compaction, stability, and function. Various types of foundations will also be studied. *Preq:* CABS 202.

304 Environmental Systems I 3(3,0) Theory of heating, ventilating, air conditioning, electrical, lighting and plumbing systems as related to building. *Preq:* Junior standing.

351 Construction Management I 3(0,9) Analysis of the basic estimating techniques as applied to construction projects in the areas of site work, concrete, masonry, steel, and carpentry. It includes a detailed study of construction methods, labor productivity, material measurement, and equipment requirements for the designated areas. *Preq:* CABS 204.

352 Construction Management II 3(0,9) Analysis of construction projects with emphasis on scheduling and resource leveling. *Preq:* CABS 351.

353 Construction Management III 3(0,9) Analysis of the various factors that make up the total cost of a construction project and a study of the basic estimating techniques required for general conditions, roofing and sheet metal, doors and windows, finishes, specialties, plumbing, HVAC, and electrical systems. *Preq:* CABS 351.

401 Formwork and Placing Concrete 3(3,0) Study of the design and construction of concrete formwork and designing and placing concrete. *Preq:* CABS 202.

402 Heavy Construction Equipment 3(3,0) Selection, financing, and management of construction equipment. *Preq:* Senior standing.

403 Environmental Systems II 3(3,0) Theory of acoustical design and control, illumination, and life safety in buildings. *Preq:* Junior standing.

452 Construction Management IV 3(0,9) Through the spring 1991. Study of business organization, policy, financial management, project management, and cost control.

453 Construction Management IV 3(0,9) Study of construction business organization, methods of project delivery, field organization, policy, ethics, project management, control systems, labor management relations, and productivity. *Preq:* CABS 352. *Coreq:* CABS 353.

454 Construction Management V 6(2,12) A terminal project will be accomplished that demonstrates a refinement of previous knowledge gained in technical, management, and general education courses. *Preq:* CABS 453.

461, 661 Construction Economic Seminar 3(3,0) Studies in urban and building economics. *Preq:* ACCT 203 and Senior standing.

490 Directed Studies 1-5 Comprehensive studies and research of special topics not covered in other courses. Emphasis will be placed on field studies, research activities, and current development in building science. *Preq:* Consent of instructor.

850 International Construction 6(0,18)

852 Construction Management Research 3(0,9)

854 Building Systems Research 3(0,9)

855 Building Environmental Systems Seminar 3(3,0)

860 Financial Planning and Analysis 3(3,0)

861 Construction Control Systems 3(3,0)

862 Personnel Management and Negotiations 3(3,0)

863 Advanced Scheduling 3(1,6)

864 Cost Analysis and Marketing 3(1,6)

865 Project Management 3(3,0)

871 Architectural Structures I 3(3,0)

872 Architectural Structures II 3(3,0)

875 Building Equipment and Systems 3(3,0)

876 Design for Natural Hazards 3(3,0)

881 Professional Seminar 3(3,0)

890 Directed Studies 3-6

891 Master's Research. Credit to be arranged.

INTERDISCIPLINARY STUDIES (CADS)

151 Design Studies I 2(0,6) Introduction to problem-solving methodology for environmental design through studio exercises, projects, and reviews. *Coreq:* CADS 153, admission to the College of Architecture.

152 Design Studies II 2(0,6) Continuation of CADS 151. *Preq:* CADS 151. *Coreq:* CADS 154.

153 Design Theory I 2(2,0) Introduction to concepts and principles of architecture, visual arts, landscape architecture, urban and regional planning, and construction management. *Coreq:* CADS 151.

154 Design Theory II 2(2,0) Continuation of CADS 153. *Coreq:* CADS 152.

251 Design Studies III 3(0,9) Studio work with adjunct demonstrations and lectures concerned with basic architectural design problems. *Preq:* CADS 152. *Coreq:* CADS 253.

252 Design Studies IV 3(0,9) Continuation of CADS 251. *Preq:* CADS 251. *Coreq:* CADS 254.

253 Design Theory III 3(2,3) Introduction to psychological and social influences, building codes, case studies, preservation and restoration, design and form determinants, with emphasis on context. *Coreq:* CADS 252.

254 Design Theory IV 3(2,3) Introduction to the theory and fundamentals of the built environment. Lectures and seminars will cover design process, basic materials and structural systems, site analysis, energy-efficient design, case studies, and graphics techniques. *Coreq:* CADS 251.

LANDSCAPE ARCHITECTURE (CALA)

Associate Professor: L. Tai

262 Landscape Architectural Technology I 3(2,3) Lecture/studio course on the technologies aspects of landscape architecture including design grading and drainage, site information gathering and analysis, horizontal and vertical alignments of walks and roadways, structures of landscape architecture, irrigation design, pools and fountains, and lighting. *Preq:* CADS 251 and sophomore standing.

351 Design Studies in Landscape Architecture V 6(0,14) Studio work with adjunct demonstrations and lectures concerned with intermediate landscape architectural design problems. *Preq:* CADS 252, 254.

352 Design Studies in Landscape Architecture VI 6(0,14) Continuation of CALA 351. *Preq:* CALA 351.

362 Landscape Architectural Technology II 3(2,3) Continuation of CALA 262. *Preq:* CALA 262. *Coreq:* CALA 351.

421 Landscape Architectural Seminar 3(3,0) Lectures and seminars dealing with pertinent topics related to environmental, technological and theoretical issues in landscape architecture, land planning, and urban design. *Preq:* Senior standing or consent of instructor.

451 Design Studies in Landscape Architecture VII 6(0,14) Studio work with adjunct demonstrations and lectures concerned with advanced landscape architectural design problems. *Preq:* CALA 352.

452 Design Studies in Landscape Architecture VIII 6(0,14) Continuation of CALA 451. *Preq:* CALA 451.

462 Landscape Architectural Technology III 3(2,3) Continuation of CALA 362. *Preq:* CALA 362.

490 Directed Studies and Projects in Landscape Architecture 1-5(0,3-15) Comprehension studies and/or research of special topics not covered in architectural courses. *Preq:* Junior standing and consent of department head.

552 Professional Landscape Architectural Design 6(0,14) Complex problem-solving projects involving regional design analysis and planning, city planning and urban design, building complex relationships, and intense site utilization and design.

562 Landscape Architectural Technology IV 2(0,6) Studio course for the integration of design and technology. *Preq:* CALA 462, professional standing. *Coreq:* CALA 552.

581 Landscape Architectural Professional Practice 3(3,0) Lecture course dealing with general consideration of landscape architectural office procedures. Study of the professional relationships of the landscape architects to client and contractor including problems of ethics, law, and business. *Preq:* Professional standing or consent of instructor.

PLANNING STUDIES (CAPL)

Professors: J. R. Caban, *Head;* B.C. Nocks; *Associate Professor:* J. B. London; *Assistant Professors:* K. R. Brooks, H. P. Norman; *Adjunct Professor:* E. L. Falk

405, 605 Urban Genesis and Form 3(3,0) This course is intended to familiarize professional students in the environmental design disciplines concerning the origin, development, and growth of cities to enable them to understand the ever accelerating growth of urbanism and increasing complexity of urban organism. *Preq:* Consent of instructor or department head.

411, 611 Introduction to City and Regional Planning 3(3,0) The purpose of the course is to introduce students from a variety of disciplines to City and Regional Planning. Spatial and nonspatial areas of the discipline are explored through a wide ranging lecture/seminar program. *Preq:* Consent of instructor or department head.

415, 615 Small City and Rural Planning 3(3,0) Examines current and future aspects and challenges of small urban centers and rural areas. Course may focus on a wide range of subjects—design, economic, social, political, physical, natural resources, and environmental—depending on the emphasis at the time.

472, 672 Implementation of the Local Planning Process 3(3,0) Organization and administration of types of planning agencies and their relationship to other governmental and private organizations. An examination of the various implementing tools (e.g., zoning subdivision regulations, covenants, others) available to local government with emphasis on the partnership between the private and public sector. *Preq:* Consent of instructor.

473, 673 Government and Planning Law 3(3,0) Complete coverage of the laws and ordinances relating to redevelopment, subdivision control, zoning, official mapping, and other topics including interpretation, philosophy, enabling legislation and model ordinances. The legal basis of current and long-range planning policy will be discussed. *Preq:* Consent of instructor or department head.

483, 683 Seminar on Planning Communication 3(3,0) Informal means open for plan implementation. The organization of effective public information and education programs, use of citizen advisory committees, and application of other implementation techniques. *Preq:* Consent of instructor or department head.

812 City and Regional Planning Theory 3(3,0)

821 Intergovernmental Relations in the Planning Process 1-3(1-3,0)

822 Urban Systems and Design 3(3,0)

823 Social, Planning and Delivery Systems 3(3,0)

- 831 Principles of Site Planning and Design 3(3,0)
- 832 Problems in Site Planning 3(1,2)
- 853 Comparative Studies in Planning Methods and Analysis 3(0,9)
- 854 Planning and Built Form Studies Studio 3(0,9)
- 858 Preliminary Planning Thesis 3(0,9)
- 859 Planning Terminal Project 3(0,9)
- 860 Planning Studio 3-6(0,9-18)
- 862 Citizen Participation in Planning 3(3,0)
- 863 Urban and Metropolitan Planning Studies Studio 3-6(0,9-18)
- 865 Advanced Landuse and Built Form Studies Studio 3-9(0,9-27)
- 871 Seminar on Planning and Management of Change 3(3,0)
- 881 Quantitative Methods and Urban Planning Policy 3(3,0)
- 882 Seminar in Mathematical Modeling for Urban and Regional Planning 3(3,0)
- 883 Techniques for Analyzing Development Impacts 3(0,9)
- 884 Public Services and Facilities Planning 3(3,0)
- 885 City and Regional Financial Planning 3(3,0)
- 889 Selected Topics in Planning 3(3,0)
- 890 Directed Studies in City and Regional Planning 1-5(0,1-5)
- 891 Planning Thesis 3-9
- 893 City and Regional Planning Internship 6(0,6)

VISUAL ARTS (CAVA)

Professors: J. T. Acorn, *Head*; R. H. Hunter, S. Wang; *Associate Professors:* T. Dimond, M. R. Hudson, J. A. Stockham, M. V. Vatalaro; *Assistant Professors:* S. A. Cross, J. W. Meyer; *Visiting Assistant Professor:* T. S. Jarrard-Dimond

203 Visual Arts Studio 3(0,6) Studio projects in basic visual elements and principles. The development of creative design process, visual organization, and design skills are introduced as a foundation for further study in the visual arts.

205 Beginning Drawing 3(0,6) A study of drawing based on the premise that drawing is a foundation discipline in the visual arts. Basic materials and approaches associated with drawing are studied and applied through studio practice, augmented by critiques, demonstrations, and lectures. *Preq:* CADS 152 or CAVA 203.

207 Beginning Painting 3(0,6) Introduction to the basic materials, methods and techniques of painting. The primary medium used is acrylic and other painting media may also be introduced. Emphasis is placed upon the basic skills in painting plus individual creative development. *Preq:* CADS 152 or CAVA 203.

209 Beginning Sculpture 3(0,6) Studio projects in the basic additive and subtractive techniques of sculpture. Emphasis on individual creative development in sculpture and a foundation in the processes of modeling, carving, construction and mold making. *Preq:* CADS 152 or CAVA 203.

211 Beginning Printmaking 3(0,6) Studio course designed to introduce basic techniques of relief printing, intaglio, lithography, silkscreen, and papermaking. Each semester concentrates on two or three of these techniques. Coursework integrated printmaking processes and creativity. *Preq:* CADS 152 or CAVA 203.

213 Beginning Photography 3(0,6) Introduction to the use of photography as an art medium. Lectures and studio work cover the utilization of the camera, processing, and printing in black and white, with emphasis on perception and creative expression. *Preq:* CADS 152 or CAVA 203.

215 Beginning Graphic Design 3(0,6) Introduction to the fundamental techniques, concepts, and principles of visual communication. Through a series of projects and studio work, students will explore techniques of communication through the use of type design, typography, photography, illustration, symbolism, and product design. Individual creative development will be stressed. *Preq:* CADS 152 or CAVA 203.

217 Beginning Ceramics 3(0,6) Basic studio course introducing ceramic arts through its various processes and techniques. Hand building methods as well as throwing on the potter's wheel are developed. Weekly projects emphasize imagination, self-expression, and skill development. Ceramic history is introduced through slide lectures. *Preq:* CADS 152 or CAVA 203.

219 Beginning Papermaking 3(0,6) Designed to explore paper, not just as a surface to receive an image, but as a material capable of being an artistic expression in and of itself. *Preq:* CADS 152 or CAVA 203.

305 Drawing 3(0,6) Study of human figure drawing with primary emphasis on drawing from live models. The student's drawing skills and fundamental understanding of the structure and form of the human figure are reviewed through studio practice, augmented by critiques, demonstrations, and lectures. *Preq:* CAVA 205 or consent of instructor.

307 Painting 3(0,6) Continuation of CAVA 207 with increased emphasis on personal expression and growth in technical competence. Some study of painting history is included in studio activity. *Preq:* CAVA 207 or consent of instructor.

309 Sculpture 3(0,6) Continuation of CAVA 209 with increased emphasis on creative concepts and more advanced techniques. Introduction to metal casting, metal fabrication, the use of plastics, and wood lamination. *Preq:* CAVA 209 or consent of instructor.

311 Printmaking 3(0,6) Continuation of processes in beginning printmaking with emphasis on expanding the range and depth of technique. The relationship of technique and process to creative idea development is emphasized. *Preq:* CAVA 211 or consent of instructor.

313 Photography 3(0,6) Continuation of CAVA 213. Advanced techniques and more diverse types of film and paper are used in making images of personal and expressive nature. The design and construction of a view camera, printing in color, and multiple imagery may also be included. *Preq:* CAVA 213 or consent of instructor.

315 Graphic Design 3(0,6) Continuation of concepts and techniques introduced in CAVA 215 with emphasis on more applied projects. Individual creative solutions are emphasized. *Preq:* CAVA 215 or consent of instructor.

317 Ceramic Arts 3(0,6) Continuation of skill development leading to more challenging projects and independent efforts. Further exposure to ceramic history, and ceramic technology are presented. *Preq:* CAVA 217 or consent of instructor.

321 Art with the Computer 3(0,6) Studio course using the microcomputer as an art medium. Studies in imaging systems, with emphasis on the creative use of the medium for artistic expression. *Preq:* CADS 152 or CAVA 203.

405, 605 Advanced Drawing 3(0,6) Advanced level studies of drawing which explore the synthesis of refined drawing skills and philosophies of art. The student's understanding of drawing as a form of art is developed through studio practice augmented by critiques, demonstrations, lectures, field trips, and independent research. *Preq:* CAVA 305 or consent of instructor.

407, 607 Advanced Painting 3(0,6) Advanced studio course in painting. Student selects painting media and is expected to develop a strong direction based on prior painting experience. Study of contemporary painters and directions are included. *Preq:* CAVA 307 or consent of instructor.

409, 609 Advanced Sculpture 3(0,6) Advanced studio work in sculpture covering the use and combination of all basic materials and processes as covered in CAVA 209, 309. Individualized studio work with opportunity for interdisciplinary study. *Preq:* CAVA 309 or consent of instructor.

411, 611 Advanced Printmaking 3(0,6) Culmination of process, techniques, and individual development. Students are expected to have mastered process and technique for the benefit of the image produced. Creativity and self-expression are highly emphasized as students select a process for concentrated study. *Preq:* CAVA 311 or consent of instructor.

413, 613 Advanced Photography 3(0,6) Continuation of CAVA 313. Advanced problems in photography. *Preq:* CAVA 313 or consent of instructor.

415, 615 Advanced Graphic Design 3(0,6) Continuation of CAVA 315. Personal expression through communication techniques will be further explored. Individual projects will be emphasized. *Preq:* CAVA 315 or consent of instructor.

417, 617 Advanced Ceramic Arts 3(0,6) Students are directed toward further development of ideas and skills. Glaze calculation and firing processes are incorporated to allow for a dynamic integration of form and ideas. *Preq:* CAVA 317 or consent of instructor.

471 Bachelor of Fine Arts Senior Project I 5(0,15) Individual studio project directed by an instructor and determined by the student in consultation with the instructor, usually focused upon a particular studio area, concept, or theme. *Preq:* Senior standing.

472 Bachelor of Fine Arts Senior Project II 5(0,15) Continuation of CAVA 471 that strengthens the student's skills and knowledge of a particular area of interest in the visual arts. *Preq:* CAVA 471, senior standing.

490, 690 Directed Studies 1-5(0,2-10) Study of areas in the visual arts that are not included in other courses or advanced work in addition to other courses. Directed studies must be arranged with a specific professor prior to registration.

840 Visual Arts Studio 3-6(0,9-18)

850 Visual Arts Studio 3(0,9)

851 Visual Arts Studio 3-6(0,9)

870 Visual Arts Studio 6(0,16)

871 Visual Arts Studio 3-6(0,8-16)

880 Visual Arts Studio 3-15(0,6-30)

891 Master's Research 3-15(0,6-30)

ASTRONOMY (ASTR)

Professor: J. R. Ray; *Associate Professors:* T. F. Collins, P. J. Flower; *Visiting Instructor:* J. T. Isbell

101 Solar System Astronomy 3(3,0) A descriptive survey of the universe, with emphasis on basic physical concepts and the objects in our solar system, is presented. Related topics of current interest will be included. For nonscience majors. This course may not be taken by a student who has completed ASTR 301.

102 Stellar Astronomy 3(3,0) A descriptive survey of the universe, with emphasis on basic physical concepts and galactic and extragalactic objects, is presented. Related topics of current interest will be included. For nonscience majors. This course may not be taken by a student who has completed ASTR 302.

103 Solar System Astronomy Laboratory 1(0,2) Optional laboratory to accompany ASTR 101. Demonstrations, laboratory exercises, planetarium visits, and a night laboratory using a small telescope, will supplement the lecture course. *Coreq:* ASTR 101.

104 Stellar Astronomy Laboratory 1(0,2) Optional laboratory to accompany ASTR 102. Demonstrations, laboratory exercises, planetarium visits, and a night laboratory, using a small telescope, will supplement the lecture course. *Coreq:* ASTR 102.

220 (GEOL) Planetary Science 3(3,0) See GEOL 220.

301 General Astronomy 3(3,0) Study of the basic physical concepts necessary for an understanding of the sun, planets, moons, asteroids, and comets that constitute our solar system and of their formation and evolution. *Preq:* MTHSC 106 and PHYS 207 or 122 or consent of instructor.

302 Astrophysics 3(3,0) Basic physical concepts necessary for an understanding of our stellar system and the observable universe beyond our galaxy. Topics include stellar evolution, galactic structure and an introduction to cosmology. *Preq:* MTHSC 106 and PHYS 208 or 221 or consent of instructor.

401, 601 Stellar Atmospheres 3(3,0) Introduction to the theory of stellar atmospheres. Topics to be discussed include radiation laws, theory of continuum radiation and spectral line formation, radiation transfer, and stellar spectra. Applications to the sun and stars will be presented. *Preq:* ASTR 302 or consent of instructor.

402, 602 Stellar Interiors and Evolution 3(3,0) Introduction to both the theoretical and observational approaches to the study of stellar evolution. The physical laws governing the temperature, pressure, and mass distributions in stars, including the equation of state, opacity and nuclear

energy generation, will be described. Stellar evolution from pre-main sequence stars to post-red giant or supergiant stars will be studied. *Preq:* ASTR 302 or consent of instructor.

403, 603 Galactic Structure 3(3,0) Introduction to the kinematics, dynamics, and content of the Milky Way galaxy. Topics include galactic rotation and mass determination, galactic distance scale, stellar populations, galactic center, spiral structure, and evolution of the galaxy. *Preq:* ASTR 302 or consent of instructor.

410, 610 Cosmology 3(3,0) Study of the large-scale structure of the universe. Discussion of experimental results includes optical, microwave, and radio observations of galaxies and quasi-stellar objects. Evolutionary models that agree with current observations are discussed. *Preq:* ASTR 302 or consent of instructor.

412, 612 Practical Astronomy 3(3,0) Instruction in the techniques of data reduction and analysis, including discussions of instrumental and observational errors. Various methods of orbital solution will be applied to observations of visual, spectroscopic, and eclipsing binary systems. *Preq:* ASTR 302 or consent of instructor.

475, 675 Selected Topics in Astrophysics 1-3(0-3,0-9) Comprehensive study of an area of astrophysics. Areas to be studied may include nucleosynthesis and stellar evolution, extragalactic distance scale, structure and evolution of galaxies, and large-scale structure of the universe. May be taken for credit more than one time. *Preq:* ASTR 302 or consent of department head.

701 Solar System Astronomy for High School Teachers 3(3,0)

711 Stellar Astronomy for High School Teachers 3(3,0)

730 Earth Science V: Astronomy for High School Teachers 3(3,0)

731 Earth Science VI: Special Topics in Astronomy 1(0,2)

732 Astronomy for Earth Science Teachers 3(3,0)

875 Seminar in Contemporary Astronomy 1-3(1-3,0)

BIOCHEMISTRY (BIOCH)

Professors: C. S. Brown, D. M. Henricks, R. H. Hilderman, G. L. Powell, J. M. Shively, J. K. Zimmerman; *Assistant Professors:* A. G. Abbott, J. P. Weinstein

101 Molecules and Man 1(1,0) Introduction to the structure and function(s) or effect(s) of some biological molecules important to man. *Preq:* Limited to freshmen or by consent of instructor.

102 Molecules and Man 1(1,0) Continuation of BIOCH 101. *Preq:* Limited to freshmen or by consent of instructor.

210 Elementary Biochemistry 4(3,3) Discussion of the kinds of compounds found in living organisms, their biochemical reactions and significance. The laboratory work parallels classroom study. *Preq:* CH 102 or 112.

301 General Biochemistry 3(3,0) Introduction to the nature, production, and replication of biological structure at the molecular level and its relation to function. *Preq:* Organic Chemistry.

302 Molecular Biology Laboratory 1(0,3) Laboratory to accompany BIOCH 301. Introduction to fundamental laboratory techniques in biochemistry and molecular biology and a demonstration of some of the fundamental principles of molecular biology discussed in BIOCH 301. *Preq:* Organic chemistry. *Coreq:* BIOCH 301.

406, 606 Physiological Chemistry 3(3,0) Chemical basis of the mammalian physiological processes of muscle contraction, nerve function, respiration, kidney function, and blood homeostasis is studied. Composition of specialized tissue such as muscle, nerve, blood and bone, and regulation of water, electrolytes and acid-base balance is discussed. *Preq:* BIOCH 210 or organic chemistry.

408, 608 Physiological Chemistry Laboratory 1(0,3) Experiments will be conducted that illustrate biochemical methodology. The use of radioisotopes, chromatography, and procedures used in the clinical biochemical laboratory will be emphasized. *Preq:* Registration in BIOCH 406.

423, 623 Principles of Biochemistry 3(3,0) Study of the chemistry of amino acids, monosaccharides, fatty acids, purines, pyrimidines and associated compounds leads to an understanding of their properties and the relationship between structure and function that make them important in biological processes. The use of modern techniques is stressed. *Preq:* CH 224 or equivalent.

424, 624 Principles of Biochemistry 3(3,0) Continuation of BIOCH 423.

425, 625 General Biochemistry Laboratory 1(0,3) Experiments selected to illustrate current methods used in biochemical research. *Preq:* Concurrent enrollment in BIOCH 423 or 431.

426, 626 General Biochemistry Laboratory 1(0,3) Continuation of BIOCH 425. *Preq:* Concurrent enrollment in BIOCH 424 or 432.

431, H431, 631 Physical Approach to Biochemistry 3(3,0) Study of chemical and physical properties of amino acids, lipids, nucleic acids, sugars and their biopolymers. Physical and mathematical analyses will be correlated with biological structure and function. *Preq:* One year of Organic Chemistry and BIOCH 301 or consent of instructor. *Coreq:* Physical Chemistry.

432, H432, 632 Biochemistry of Metabolism 3(3,0) Study of the central pathways of carbohydrate, lipid, protein, and nucleic acid metabolism. Bioenergetics, limiting reactions, and the regulation and integration of the metabolic pathways will be emphasized. *Preq:* BIOCH 431 or consent of instructor.

441, H441, 641 Molecular Biology 3(3,0) Course dealing with the principles of replication, transcription, and translation. Emphasis will be placed on the experimental data used to study these principles. *Preq:* BIOCH 423 and 424 or 431 or consent of instructor.

491, H491 Special Problems in Biochemistry 1-8(0,3-24) Orientation in biochemical research; i.e., experimental planning, execution, and reporting. May be repeated for a maximum of 8 credits.

810 Advanced Biochemical Techniques 1-3(0,3-9)

815 Lipids and Biomembranes 3(3,0)

817 Chemistry and Metabolism of Hormones 3(3,0)

819 Regulation of Intermediary Metabolism 3(3,0)

820 Nucleic Acids and Protein Biosynthesis 3(3,0)

821 Proteins 3(3,0)

822 Enzymes 3(3,0)

824 Cellular Regulations at the Molecular Level 3(3,0)

825 Neurochemistry 3(3,0)

831 Physical Biochemistry 3(3,0)

851 Biochemistry Seminar 1(1,0)

871 Advanced Topics 1-3(1-3,0)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

BIOENGINEERING (BIOE)

Professors: J. M. Colacino, R. L. Dooley, A. F. von Recum, *Head*; *Associate Professors:* D. L. Powers, C. L. Vaughan; *Assistant Professor:* F. H. Bilge; *Visiting Professor:* G. Heimke; *Adjunct Professors:* E. W. Berg, L. S. Bowman, G. Cooper IV, R. A. Draughn, H. I. Friedman, R. M. Sade, T. N. Salthouse, F. A. Young, Jr.; *Adjunct Assistant Professors:* E. Barth, R. A. Straup

301 Engineering Aspects of Biology and Medicine 2(2,0) The relationships of various branches of engineering to biology and medicine. Structural engineering, fluid flow, and mass transfer in living systems. Artificial organs, biomaterials, implants, instrumentation, and other engineering challenges are discussed.

302 Biomaterials 3(3,0) Study of metallic, ceramic, and polymer materials used for surgical and dental implants. Materials selection, implant design, physical and mechanical testing. Corrosion and wear in the body. In addition, physical and mechanical properties of tissue as related to microstructure are studied. *Preq:* CRE 310 or consent of instructor.

303 Artificial Organs 3(3,0) Designed to provide engineering and biological and physical science students with an insight into the problems associated with replacing parts of the human body with artificial devices. Lectures will be supplemented with demonstrations and medical films.

320 Introduction to Structural Biomechanics 3(3,0) Introduction to the analysis of the mechanical function of the human body and the effect of external forces on the body. The study of the mechanics of the skeletal system is the main emphasis of the course. *Preq:* EM 201.

401, 601 Computers for Bioscientists 1(1,0) Analog and digital simulation of biochemical and biological processes. Systems approaches, dynamic analysis, interactions between laboratory research and computer models. *Preq:* One semester of calculus or consent of instructor.

402, 602 Medical Applications of Engineering 3(3,0) A survey of the applications of physical principles to health science. Topics included are production and detection of X-rays, diagnostic radiology and radiation therapy, nature of radioactive emissions, relative biological effectiveness, nuclear medicine, radiation protection, surgical uses of lasers, cryogenics, cryobiology and cryosurgery, ultrasound, electrosurgery. *Preq:* General chemistry.

415, 615 Dental Materials 2(2,0) An interdisciplinary course which reviews the biological and engineering aspects of dental materials. Topics include: Properties and Structure of Materials (polymers, metals, alloys, ceramics, composites, degradation of materials in oral environment) and Applied Dental Materials (cement, amalgam, impression materials, gypsum compounds, waxes, gold and its alloys, base-metal alloys, polymers applied in dentistry, recent advances in dental implant materials). *Preq:* CH 223 and PHYS 208.

450, 650 Special Topics in Biomedical Engineering 1-4(0-4,12-0) Comprehensive study of a topic of current interest in the field of biomedical engineering. May be taken for credit more than one time. *Preq:* Consent of instructor.

800 Seminar in Bioengineering 1(1,0)

801 Biomaterials 3(3,0)

802 Compatibility of Biomaterials 3(1,6)

803 Polymers as Biomaterials 3(3,0)

812 Orthopedic Pathology 3(3,0)

820 Structural Biomechanics 3(3,0)

821 Biomechanics of Human Motion 3(2,2)

823 Artificial Cardiac Assistance and Replacement 2(2,0)

840 Creative Biomedical Engineering Design 3(2,2)

847 Elements of Bioengineering 4(4,0)

850 Special Topics in Biomedical Engineering 1-4(0-4,12-0)

870 Bioinstrumentation 3(2,2)

882 Experimental Surgery 4(2,6)

890 Internship 1-5(0,8-40)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

BIOLOGICAL SCIENCE (BIOSC)

201 Plant Diversity 4(3,3) Survey of the major groups of plants, their structure, development, and reproduction. Evolutionary relationships as exemplified by comparisons of body organization and life cycles will be emphasized. *Preq:* BIOL 104/106 or 111 or BOT 205.

202 Animal Diversity 4(3,3) Survey of animal diversity with emphasis on structure, function, and evolution of the major taxa. Representative organisms will be observed and dissected in the laboratory. *Preq:* BIOL 111 or consent of instructor.

210 Biology of Culture and Religion 3(3,0) Drawing on findings from sociobiology, evolution, genetics and molecular biology, this course examines the biology of man's culture and religion. Topics include the coevolution of culture and gene systems; adaptive significance of religion; evolution, free-will and creative process; altruism; mysticism and states of consciousness. *Preq:* BIOL 103 and 104 or consent of instructor.

241 Ecology, the Environment, and Human Society 3(3,0) Basic principles of population biology, ecology, and environmental science as applied to the study of the interactions between human society and the biosphere. *Preq:* BIOL 104 and 106 or BIOL 111 or BOT 205.

280 Industry and the Biologist 3(3,0) Course will introduce the student to biological principles applied by industry and the regulatory agencies concerning establishment of an industrial facility discharging effluent into a recreational river. *Preq:* One year of biology.

281 Industrial Biologist's Survey of Natural Resource Regulations 2(2,0) A survey of the laws and regulations protecting natural resources, emphasizing the historical perspectives and impacts on regulated communities by utilizing actual case studies. *Preq:* One year of biology or consent of instructor.

311 Tropical Biology 3(1,6) Fundamental approach to basic ecological and evolutionary principles in tropical ecosystems, concentrating primarily on the rainforest and coral reef. Laboratory includes a field trip to Belize over the spring break. *Preq:* BIOL 103 and 104, or 110 and 111 or equivalent; or consent of instructor.

418, 618 (MICRO) Biotechnology I: Nucleic Acids Techniques 4(2,4) Designed to provide basic training in the manipulation of genetic information using recombinant DNA technology. Included are techniques in molecular cloning, Southern and Northern analysis, clone library construction. *Preq:* BIOCH 210 or 301, MICRO 305, consent of instructor.

430, 630 (AGE) Bioenergetics for Engineers 4(3,3) See AGE 430.

435, 635 Principles of Evolution 4(4,0) Introduction to the fundamental principles and major concepts of the evolutionary process in animals, including a consideration of evolutionary theories, adaptive processes in populations, and major evolutionary patterns and to the principles of classification and systematics. *Preq:* GEN 302 or consent of instructor.

441, 641 Ecology 4(3,3) Fundamental approach to basic ecological principles underlying the inter-relationship of organisms with their biotic and abiotic environments. *Preq:* BIOL 104/106 or 111.

442, 642 Biogeography 3(3,0) Study of patterns of distribution of plants and animals in space and time. *Preq:* BIOSC 201 and 202 or consent of instructor.

443, 643 Aquatic Ecology 4(3,3) Study of basic ecological principles and concepts as they apply to aquatic environments: rivers and streams, lakes and ponds, reservoirs, swamps, marshes, estuaries, and marine systems. Laboratories will provide practical experience in techniques and methods used in the ecological analysis of physical, chemical, and biological properties of aquatic systems. *Preq:* Junior standing in a life science.

452, 652 Anatomy and Morphology of Vascular Plants 4(3,3) Studies of the anatomy, reproduction, and phylogenetic relationships of vascular plants. *Preq:* BIOL 104/106 or 111 or BOT 205 or consent of instructor.

461, 661 Cell Biology 4(3,3) Study of structure, function, and diversity of cells and cell biological technique, emphasizing biomembrane function, energy transduction, motility, cell cycle, secretion, and cellular digestion. Laboratory exercises will reinforce the principles presented in lecture and introduce several modern techniques used in cell biological research. *Preq:* BIOCH 301 or consent of instructor.

483, 683 Regulatory Biology I 4(3,3) Introduction to topics and techniques employed in the practice of regulatory biology, focusing on biological aspects of water, waste, and air problems. Actual litigations, plant sitings, and public documents will be used throughout the course. May be taken subsequent to BIOSC 484. *Preq:* One year of biology, one year of chemistry, one course in microbiology, or consent of instructor.

484, 684 Regulatory Biology II 4(3,3) The second course in a two-part series, introducing the student to the concerns of mutagenesis, teratogenesis, and carcinogenesis in an industrial setting with actual case problems studied. May be taken before BIOSC 483. *Preq:* One year of biology, one year of chemistry, a biochemistry course, or consent of instructor.

485, 685 Biological Assessment of Aquatic Environments 4(3,3) Course that teaches the theory and application of protocols using living organisms in monitoring biological effects of pollutants on aquatic systems. Fieldwork, laboratory, and contemporary case studies are emphasized. *Preq:* One year of introductory biology, one year of chemistry, an animal diversity course, or consent of instructor.

BIOLOGY (BIOL)

Professors: D. R. Helms, W. H. Leonard; *Associate Professors:* R. A. Garcia, R. J. Kosinski, C. K. Revis-Wagner, W. M. Surver, *Acting Head:* Assistant Professors: J. L. Dickey, M. V. Ruppert, D. J. Stroup; *Instructors:* S. Aneja, A. D. Smith; *Lecturer:* J. G. Schaadt; *Visiting Assistant Professor:* D. L. Mann

103 General Biology I 3(3,0)¹ The first course in a two-semester sequence on the fundamentals of biology. Emphasizes the structural, molecular, and energetic basis of cellular activities, fundamentals of genetic variability, and reproductive strategies of organisms. Diversity of animals and principles of evolution are introduced.

104 General Biology II 3(3,0)¹ Continuation of BIOL 103, emphasizing animals and plants as functional units, evolution and diversity of plants, and principles of evolution and ecology. *Preq:* BIOL 103.

105 General Biology Laboratory I 1(0,3)¹ Laboratory course that illustrates through experimentation, and/or demonstration the structure and activities of cells, genetics, and diversity of animals. Strongly recommended for students taking BIOL 103. *Coreq:* BIOL 103 or consent of instructor.

106 General Biology Laboratory II 1(0,3)¹ Laboratory course that illustrates through experimentation and/or demonstration the diversity of microbes, fungi, and plants. The structure and function of animals and plants, and the study of evolution and ecology are also emphasized. The course is strongly recommended for students taking BIOL 104. *Coreq:* BIOL 104 or consent of instructor.

110 Principles of Biology I 5(4,3)¹ Introductory course designed for students majoring in biological disciplines of the College of Sciences. The course integrates lecture and laboratory and emphasizes a modern, quantitative, and experimental approach to explanations of structure, composition, dynamics, interactions, and evolution of cells and organisms. High school chemistry is recommended. *Coreq:* CH 101.

111 Principles of Biology II 5(4,3)¹ Continuation of BIOL 110 that emphasizes the study of plants and animals as functional organisms and the principles of ecology. *Preq:* BIOL 110.

700 Classical Genetics 1

701 Microcomputer in the Biology Curriculum I 1

702 Ecology 1

703 Survey of the Kingdoms Monera, Protista, and Fungi 1

704 Analytical Thinking in Biology 1

705 Public Health Microbiology 1

706 Basic Methods of Preserving Vertebrates for Teaching Collections 1

707 Preparation of Plants for Permanent Teaching Collections 1

708 Food Microbiology 1

709 Biological Microscopy and Microtechnique 1

710 Special Institute Course: Selected Topics in Biology 1-6(0-6,0-18)

711 Conceptual Themes in Biology 3(2,2)

731 Microcomputer in the Biology Curriculum II 1

732 Microecosystems in the Classroom 1

733 The Brain, Nervous System, and Sense Organs 1

734 The Physiology of Respiration 1

761 Microcomputer in the Biology Curriculum III 1

762 Human Genetics 1

763 Fundamental Immunology and Serology in Public Health 1

764 Modern Molecular Genetics 1

¹Credit toward a degree will be given for only one combination of the following: BIOL 110 or 103/105 followed by BIOL 111 or 104/106, dependent on the requirements for the major

BOTANY (BOT)

Professors: N. D. Camper, C. R. Dillon, J. E. Fairey III; *Associate Professors:* R. E. Ballard, L. A. Dyck, T. M. McInnis, Jr., K. M. Peterson; *Visiting Professor:* J. B. Whitney, Jr.

145 Environmental Dynamics 2(2,0) Nontechnical ecology course designed to aid in understanding the natural world and how it operates. Taught in the jargon of the mass media, it is designed for nonbiologists though biology students may find that it helps in assimilation of the major ecological concepts.

146 Environmental Dynamics Practicum 1(0,3) Course designed to give first-hand experience, either through analysis or observation, of the topics covered in BOT 145. *Coreq:* BOT 145.

203 Humanistic Botany 3(3,0) Nontechnical course emphasizing plant species that have had an impact on human cultural development: history, economics, religion, comfort, and pleasure. *Preq:* BIOL 104/106 or 111 or BOT 205.

205 Plant Form and Function 4(3,3) Introductory course designed for students majoring in plant sciences of the College of Agricultural Sciences and the College of Forest and Recreation Resources. The course integrates lecture and laboratory and emphasizes fundamental structures and functions of higher plants. *Preq:* BIOL 103, 105, or consent of instructor.

221 Medical Botany 2(2,0) Nontechnical course dealing with plant-originated drugs and substances used in modern treatment of physical and mental maladies of man will be studied along with plant products historically associated with folk medicine. Plants producing substances which are remedial, psychoactive, poisonous, carcinogenic, antibiotic, hallucinogenic, and others are included in this study. *Preq:* BIOL 104/106 or 111 or BOT 205.

301 Field Botany 3(2,3) Introductory study of the taxonomy, ecology, and evolutionary processes of plants native to South Carolina. Emphasis is on field work which requires visits to many different habitats for observation and study of plant diversity. *Preq:* BIOL 104/106 or 111 or BOT 205.

411, 611 Introductory Mycology 4(3,3) Introduction to the biology of all the groups of fungi and some related organisms, with considerations of the taxonomy, morphology, development, physiology and ecology of representative forms. Laboratory includes collection, identification and culture of native fungi. *Preq:* BIOL 104/106 or 111 or BOT 205.

413, 613 Phycology 4(3,3) Introduction to the biology of algae. Consideration is given to the structure, classification, evolution, natural history, physiology, and ecology of all algal groups. Laboratory includes experimentation, collection and identification of both freshwater and marine algae, and field trip to the Florida Keys over the spring break. *Preq:* BIOL 104/106 or 111 or BOT 205.

421, H421, 621 Plant Physiology 4(3,3) The relations and processes which pertain to maintenance, growth and reproduction of plants, including absorption of matter and energy, water relations of the plant, utilization of reserve products and liberation of energy. *Preq:* CH 101, 102, PHYS 207 or 221 and 223.

431, H431, 631 Introductory Plant Taxonomy 4(3,3) Introduction to the basic principles and concepts of plant systematics with laboratory and field emphasis on the flora of South Carolina. *Preq:* BIOL 104/106 or 111 or BOT 205.

456, 656 Plant Microtechnique 2(0,6) Application of the principles of microtechnique involved in the fixing, cutting, and staining of plant tissues. *Preq:* Consent of instructor.

491 Special Problems in Botany 2-4(0,6-12) Research problems in selected areas of botany to provide an introduction to research planning and techniques for Botany majors. *Preq:* Senior standing and consent of department head.

H492 Special Problems in Botany 1(0,3) Continuation of BOT 491. Research results from BOT 491 are written in a style appropriate for publication and presented in an open seminar. *Preq:* BOT 491.

701 Evolutionary Botany for Teachers 3(2,3)

702 Modern Botanical Concepts for Teachers 3(3,0)

805 Special Problems in Botany. Credit to be arranged.

807 Seminar 1(1,0)

813 Special Topics in Mycology 2-4(0-2,0-6)

- 815 Phycology Colloquium 1-3(1-3,0)
- 821 Inorganic Plant Metabolism 4(3,3)
- 822 Organic Plant Metabolism 3(3,0)
- 823 Plant Growth and Development 3(3,0)
- 824 Mode of Action of Growth Substances 4(3,3)
- 831 Advanced Plant Taxonomy 4(3,3)
- 832 Special Topics in Plant Systematics 1-4(1-3,0-3)
- 835 Evolution of Plant Species 3(3,0)
- 837 Evolution of Angiosperms 3(3,0)
- 841 Biology of Aquatic Vascular Plants 3(2,3)
- 842 Physiological Plant Ecology 3(3,0)
- 843 Physiological Plant Ecology Laboratory 1(0,3)
- 845 Special Topics in Plant Ecology 1-4(1-3,0-3)
- 846 Plant Ecology 4(3,3)
- 850 Plant Tissue and Cell Culture 3(2,3)
- 851 Plant Anatomy 3(2,3)
- 861 Plant Cell Biology 3(3,0)
- 891 Master's Research. Credit to be arranged.
- 921 (HORT) Plant Physiology Colloquium 1(1,0)
- 991 Doctoral Research. Credit to be arranged.

CERAMIC ARTS (CRAR)

Professor: G. C. Robinson; *Associate Professor:* H. G. Lefort

101 Pottery Materials 3(2,3) Occurrence and properties of pottery raw materials. Attention is devoted to the occurrence of natural pottery materials in South Carolina and the methods and equipment used in preparing these materials.

102 Pottery Drying and Firing 3(3,0) The drying and firing process used in pottery making. A discussion is included on the design and construction of simple pottery kilns, and the student is required to build and operate a small outdoor kiln. The laboratory work demonstrates the drying and firing behavior of pottery.

CERAMIC ENGINEERING (CRE)

Professors: C. C. Fain, G. Lewis, *Head*; G. C. Robinson; *Associate Professors:* H. G. Lefort, T. D. Taylor; *Assistant Professors:* D. R. Dinger, B. I. Lee, H. D. Leigh III, E. C. Skaar

201 Introduction to Ceramic Engineering 2(2,0) Introduction to ceramic engineering together with a study of nonclay-silicate ceramic raw materials, property measurements, and terminology used in the manufacturing sequences of ceramic products.

202 Processing Ceramic Raw Materials into Products 3(3,0) Study of the manufacturing of ceramic products from the point of view of clay-silicate raw materials characterization and preparation, mixing for quality, the characteristics of mixtures throughout the manufacturing sequences, and the study of forming procedures to obtain quality products.

203 Introduction to Ceramic Engineering Calculations 2(1,1) Designed to meet the needs of ceramic engineers by providing a structured introduction to fundamental calculations in the field of ceramic and materials engineering. Each type of problem is related to ceramic processing or testing. The calculations are performed using a spreadsheet format and microcomputer. *Preq:* ENGR 180.

204 Laboratory Procedures 1(0,3) Introduction to ceramic laboratory procedures. Primary consideration will be given to the evaluation of sources of error and significance of measurement in the major ceramic test procedures.

302 Thermo-Chemical Ceramics 3(3,0) High-temperature equilibrium using the laws of physical chemistry as applied to ceramic systems in both solid and liquid states. An introduction to the crystal chemistry of ceramic raw materials, and the effect of crystalline form on their high-temperature behavior.

303 Materials Technology in Product Selection by Consumers 2(2,0) Intended to convey to the consumer a sufficient understanding of the properties of materials—metals, plastics, and ceramics—to enable the customer to make intelligent buying decisions. Property characteristics are related to cost and performance. Specific cases involving decisions are used to illustrate fundamental principles. Simple tests to determine material properties are suggested for consumer use.

304 Experiment Design 2(0,6) Exercise in the planning and organization of experiments in the ceramic field.

306 Fuels Combustion and Heat Transfer 1(0,3) Combustion devices, the calculation of combustion problems and heat transfer.

307 Thermal Processing of Ceramics 3(3,0) The accomplishment of changes in structure and composition through the application of thermal energy. The course includes a study of simultaneous transfer of heat and mass, fluid flow, determinants of rates in a variety of reactions and calculations of the energy requirements to accomplish change in structure or composition.

309 Research Methods 2(0,6) The planning and solution of selected research problems.

310 Introduction to Material Science 3(3,0) A beginning course in material science designed primarily for engineering students. Study of the relation between the electrical, mechanical and thermal properties of products and the structure and composition of these products. All levels of structure are considered from gross structures easily visible to the eye through electronic structure of atoms.

311 Kinetics of Materials Processes 3(3,0) Study of the kinetics of solid-solid, solid-liquid and solid-gaseous reaction as they apply to materials system, energy transport as applied to materials processing, and the importance of these phenomena to manufacturing and design of materials. *Preq:* CH 331.

400 Ceramic Seminar 1(1,0) Seminars used to expose Engineering majors to topics in the ceramic engineering profession. Invited lecturers as well as faculty and students will participate. Course may be repeated for a total of 4 credits. *Preq:* Junior standing in Ceramic Engineering or consent of instructor.

402, H402, 602 Solid State Ceramics 3(3,0) The effects of the composition, form, and shape of ceramic raw materials on the manufacturing processes and final properties of ceramic products. Included are fundamental studies of such phenomena as deflocculation, plasticity, sintering and the behavior of ceramic products in electrical circuits. *Preq:* Junior standing.

403, H403, 603 Glasses 3(3,0) Glass structure and composition and their relation to the properties of glasses. Consideration is given to the processing variables which control the properties of glasses including glass products, enamels, glazes, and vitreous bonds.

404, 604 Ceramic Coatings 3(3,0) The raw materials, methods of manufacture, and properties of ceramic coatings. *Preq:* CRE 302.

406 Ceramic Project 2(0,6) The completion of an original research into a ceramic problem. *Preq:* CRE 302.

407 Plant Design 3(1,6) The application of the fundamentals of ceramic engineering to problems in plant design. *Preq:* Senior standing in Ceramic Engineering.

410, 610 Analytical Processes 3(2,3) Introductory course on the theory and use of X-ray diffraction and spectroscopic methods. *Preq:* Junior standing.

412, 612 Raw Material Preparation 3(3,0) Equipment and processes used in the crushing and grinding of raw materials, separation and classification of particle sizes, and separation and purification of minerals by mineral dressing methods.

414, 614 Processing of Ceramics 3(3,0) Course covers ceramic processing after the raw material preparation with emphasis on modern processing theories and practices. Topics include nature of particles, forming methods, characterization techniques, consolidation by heat, surface chemistry

of solids, and chemical processing of specialized ceramics and composites. *Preq:* CH 102 or equivalent.

416, 616 Electronic Ceramics 3(3,0) Theory and measurement of the electronic properties of ceramic products.

418, 618 Process Control 3(3,0) Process control techniques and apparatus with particular emphasis on temperature measurement and control systems. The application of laboratory techniques to the control of product quality and process efficiency is included. *Preq:* Junior standing.

419, H419, 619 Science of Engineering Materials 3(3,0) Course planned to acquaint engineers with the thermal, electrical, and chemical characteristics of engineering materials. It emphasizes fundamental consideration of the structure of matter in the solid and glassy states, solid state reactions, and the influence of particle and aggregate structure to speed of reaction and product properties. The reasons for the properties of materials at elevated temperatures and room temperatures are related to these fundamentals.

420, 620 Science of Engineering Materials 3(3,0) Continuation of CRE 419 with emphasis on application of fundamentals in nuclear reactors and nuclear power plants. Consideration is given to the development of ceramics for fuel elements, moderator materials, control rods, shielding and radioactive waste disposal.

425, 625 Specialized Processing of Ceramic Materials 3(2,2) Processing of ceramic materials under conditions such as ultra high vacuum or gravity-free conditions. Emphasis will be placed on adapting one selected ceramic process to a set of special conditions selected by the instructor. *Preq:* Junior standing in engineering or consent of instructor.

490, H490, 690 Special Topics in Ceramic Engineering 1-3(1-3,0) Study of topics not ordinarily covered by other courses. Taught as the need arises. Typical topics could include current research in a specific area or technological advances. Course may be repeated up to a limit of 6 credits. *Preq:* Consent of instructor.

701 Special Problems 3(1-3,0)

800 Ceramic Engineering Seminar 1(1,0)

807 Specialized Ceramics 3(3,0)

809 High Temperature Materials 3(3,0)

814 Ceramic Physical Processing 3(3,0)

815 Colloidal and Surface Science 3(3,0)

816 Constitution and Structure of Glasses 3(3,0)

821 Analytical Procedures and Equipment I 3(2,3)

822 Analytical Procedures and Equipment II 3(2,3)

824 Mechanical Properties of Ceramic Materials 3(3,0)

825 Magnetic and Electrical Ceramic Material 3(3,0)

826 Ceramic Coatings 3(3,0)

828 Solid State Ceramic Science 3(3,0)

832 Ceramic Reaction Thermodynamics 3(3,0)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

CHEMICAL ENGINEERING (CHE)

Professors: F. C. Alley, W. B. Barlage, Jr., C. H. Barron, Jr., *Head*; J. N. Beard, Jr., W. F. Beckwith, D. D. Edie, S. S. Melsheimer, J. C. Mullins; *Associate Professors:* C. H. Gooding, R. W. Rice; *Assistant Professors:* A. A. Ogale, M. C. Thies; *Lecturer:* G. B. Pullen

201 Introduction to Chemical Engineering 3(2,2) Introduction to the concepts of chemical engineering and a study of PVT relations for gases and vapors, material and energy balances, equilibria in chemical systems, and combined material and energy balances. *Preq:* CH 112, ENGR 180.

220, H220 Chemical Engineering Thermodynamics I 3(3,0) Topics include the First and Second Laws of Thermodynamics, ideal gases, heat engines and lost work, and the volumetric and thermodynamic properties of pure fluids. *Preq:* CHE 201 and MTHSC 206.

301 Unit Operations Theory I 3(3,0) The general principles of chemical engineering and a study of the following unit operations: fluid flow, fluid transportation, heat transmission and evaporation. Special emphasis is placed on theory and its practical application to design. *Preq:* CHE 201, MTHSC 206.

302 Unit Operations Theory II 3(3,0) Study of selected unit operations based on diffusional phenomena. Primary attention will be given to differential contact operations such as absorption, humidification, and gas-liquid contact. *Preq:* CHE 301, 352.

306 Unit Operations Laboratory I 2(1,3) Laboratory work in the unit operations of fluid flow, heat transfer, and evaporation. Stress is laid on the relation between theory and experimental results and on report writing. *Preq:* CHE 301.

321, H321 Chemical Engineering Thermodynamics II 3(3,0) Continuation of CHE 220. Topics include the thermodynamics of power cycles and refrigeration/liquefaction, the thermodynamic properties of homogeneous mixtures, phase equilibria, and chemical reaction equilibria. *Preq:* CH 331 and CHE 220, 352.

352, H352 Process Modeling and Numerical Methods 3(3,0) This course will introduce students to some basic concepts of chemical process modeling and the use of numerical methods of solution of typical chemical engineering problems. Digital computational techniques for the numerical methods will use a specific procedure-oriented language such as Fortran. *Preq:* CHE 201 and MTHSC 208.

353, H353, 653 Process Dynamics 3(3,0) Basic process control and the effect of feedback in various systems. The mathematical analysis of the dynamic response of process systems to step and sinusoidal changes. Determination of the optimum settings for various combinations of proportional, reset and derivative control. *Preq:* CHE 301, 352 or equivalent, and MTHSC 208.

401, H401, 601 Transport Phenomena 3(3,0) Mathematical analysis of single and multi-dimensional steady-state and transient problems in momentum, energy, and mass transfer. Both the similarities and differences in these mechanisms are stressed. *Preq:* CHE 302 and MTHSC 208.

403, H403 Unit Operations Theory III 3(3,0) Study of unit operations not covered in CHE 301 and 302. Includes liquid-liquid extraction, distillation, and other unit operations. *Preq:* CHE 302, 321 and CH 332.

407 Unit Operations Laboratory II 3(1,6) Continuation of CHE 306 with experiments primarily on the diffusional operations. Additional lecture material on report writing and general techniques for experimental measurements and analysis of data. *Preq:* CHE 302, 306, 353.

412, 612 Polymer Engineering 3(3,0) Design-oriented course in synthetic polymers. Topics include reactor design used in polymer production, effect of step versus addition kinetics on reactor design, epoxy curing reactions, polymer solubility, influence of polymerization, and processing conditions of polymer crystallinity. *Preq:* CH 224 and 332 or consent of instructor.

415, 615 Introduction to Nuclear Engineering 3(3,0) Designed to acquaint the nonnuclear engineer with some of the engineering aspects of nuclear science. Topics include a brief survey of particle physics; nuclear reactions; energy transformations; nuclear reactors, their design, construction and use; radiation damage to materials of construction; and special problems in nuclear engineering peculiar to the basic engineering disciplines. *Preq:* Junior or Senior standing in engineering, chemistry, or physics.

421 Process Development, Design, and Optimization of Chemical Engineering Systems I 3(2,3) Study of the steps in creating a chemical process design from the original concept to successful completion and operation of the plant. Topics include engineering economics, systems analysis, simulation, optimization, process equipment sizing and selection, and the application of analog and digital computers. *Preq:* CHE 302.

422 Process Development, Design, and Optimization of Chemical Engineering Systems II 3(0,9) Continuation of CHE 421. The principles of process development, design, and optimization are applied in a comprehensive problem carried from a general statement of the problem to detailed design and economic evaluations. *Preq:* CHE 321, 353, 403, 421 and 450 or consent of department head.

424, 624 Introduction to Industrial Pollution 3(3,0) Introduction to air and water pollution problems associated with chemical processing, transportation and power generation. Basic processes

and mechanisms utilized in the control of liquid and gaseous wastes are discussed from a standpoint of equipment design and economics. Present and future trends in pollution legislation are reviewed. *Preq:* Senior standing or consent of instructor.

426 Pulp and Paper Engineering 3(3,0) Study of the unit processes and design of the processing equipment used in the pulp and paper industry. *Preq:* CH 102 or 112.

428, 628 (AGE) Biochemical Engineering 3(3,0) Use of microorganisms and enzymes for the production of chemical feedstocks, single-cell protein, antibiotics, and other fermentation products. Topics include kinetics and energetics of microbial metabolism, design and analysis of reactors for microbial growth and enzyme-catalyzed reactions, and considerations of scale-up, mass transfer, and sterilization during reactor design. *Preq:* Agricultural Engineering majors take AGE (BOSC) 430 and MICRO 305, BIOCH 301; Chemical Engineering majors take CHE 302 as *preq* and CHE 450 as *coreq*.

440 Chemical Engineering Senior Seminar I 0(1,0) Topics covered include oral communication, job interviewing skills, professionalism and professional ethics, and chemical engineering job functions in various industries. Oral presentations are given by students, and invited speakers from the profession will discuss issues of current interests. To be taken Pass/Fail only. *Preq:* CHE 302. *Coreq:* CHE 421.

441 Chemical Engineering Senior Seminar II 0(1,0) Continuation of CHE 440. To be taken Pass/Fail only. *Preq:* CHE 440. *Coreq:* CHE 422.

450, H450, 650 Chemical Engineering Kinetics 3(3,0) Introduction to the kinetics of chemical reactions. Topics include homogeneous and heterogeneous reactions, batch and flow reaction systems, catalysis, and design of industrial reactors. *Preq:* CHE 301, 321, MTHSC 208 and CH 332.

454, 654 Computer Process Control 3(3,0) Introduction to digital computer control as applied in the chemical process industries. Topics include dynamics of process systems, control computer hardware and software, sampled data mathematics, digital control algorithms, process identification, and advanced control techniques. *Preq:* CHE 353 or equivalent and ECE 307, MTHSC 208.

491, H491 Special Projects in Chemical Engineering 1-3(1-3,0) As a need arises, special topics requested by students or offered by the faculty will be taught. Review of current research in an area, technological advances and national engineering goals are possible topic areas.

802 Process Dynamics and Control 3(3,0)

803 Advanced Transport Phenomena 3(3,0)

804 Chemical Engineering Thermodynamics 3(3,0)

805 Chemical Engineering Kinetics 3(3,0)

813 Chemical Engineering Finite Element Analysis 3(3,0)

814 Applied Numerical Methods in Process Simulation 3(3,0)

815 Polymer Engineering Laboratory 3(2,3)

818 Polymer Processing 3(3,0)

819 Viscoelastic Properties of Polymers and Polymeric Composites 3(3,0)

820 (TC) Composite Polymeric Materials 3(3,0)

821 Heat Transport 3(3,0)

822 Mass Transfer and Differential Contact Operation 3(3,0)

823 Mass Transfer and Stagewise Contact Operation 3(3,0)

834 Advanced Chemical Engineering Thermodynamics 3(3,0)

845 Selected Topics in Chemical Engineering 3(3,0)

846 Selected Topics in Chemical Engineering 3(3,0)

890 Special Projects 1-6(1-6,0)

891 Master's Research. Credit to be arranged.

895 Chemical Engineering Graduate Seminar 0(1,0)

945 Selected Topics in Chemical Engineering 3(3,0)

946 Selected Topics in Chemical Engineering 3(3,0)

991 Doctoral Research. Credit to be arranged.

CHEMISTRY (CH)

Professors: R. A. Abramovitch, J. F. Allen, A. L. Beyerlein, M. B. Bishop, D. D. DesMarteau, *Head;* J. C. Fanning, J. F. Geldard, J. W. Huffman, N. P. Marullo, J. D. Petersen, G. B. Savitsky, H. G. Spencer, J. L. von Rosenberg, Jr.; *Associate Professors:* C. B. Bishop, R. C. Dieter, K. Dill, T. G. Tisue, R. R. Williams; *Assistant Professors:* M. M. Cooper, A. L. Kholodenko, J. W. Kolis, R. K. Marcus, G. H. Robinson; *Lecturer:* W. T. Pennington; *Visiting Professor:* J. D. Spain

101 General Chemistry 4(3,3) Students are introduced to the elementary concepts of chemistry through classroom and laboratory experience. The course emphasizes chemical reactions and the use of symbolic representation, the mole concept and its applications and molecular structure.

102, H102 General Chemistry 4(3,3)¹ Continuation of CH 101, treating solutions, rates of reactions, chemical equilibrium, electrochemistry, chemistry of selected elements, and an introduction to organic chemistry. For students taking one year of chemistry or continuing in CH 201.

112 General Chemistry 4(3,3)¹ Continuation of CH 101 which emphasizes solutions, thermodynamic concepts, kinetics and oxidation-reduction reactions. The laboratory emphasizes solution chemistry and qualitative analyses. Recommended for students continuing in CH 223.

141 Chemistry Orientation 1(1,0) Lectures, discussions, and demonstrations devoted to health and safety in the chemistry laboratories; use of the chemical literature; and career planning. *Preq:* Registration in CH 101.

201 Survey of Organic Chemistry 4(3,3)² Introduction to organic chemistry emphasizing nomenclature, classes of organic compounds, chemistry of functional groups. For students needing a one-semester course in organic chemistry. *Preq:* CH 102 or consent of instructor.

205 Introduction to Inorganic Chemistry 2(2,0) One semester treatment which emphasizes the properties and reactions of the more common chemical elements. *Preq:* Registration in CH 112.

223 Organic Chemistry 3(3,0)² Introductory course covering the principles of organic chemistry and the derivation of these principles from a study of the properties, preparations, and interrelationships of the important classes of organic compounds. *Preq:* CH 112 or consent of instructor.

224 Organic Chemistry 3(3,0) Continuation of CH 223. *Preq:* CH 223.

225 Organic Chemistry Laboratory 2(0,6)³ The laboratory techniques involved in the synthesis, separation and purification, and characterization of typical examples of the classes of organic compounds. *Preq:* Registration in CH 223.

226 Organic Chemistry Laboratory 2(0,6)⁴ Continuation of CH 225. *Preq:* Registration in CH 224.

227 Organic Chemistry Laboratory 1(0,3)³ The synthesis and properties of typical examples of the classes of organic compounds. *Preq:* Registration in CH 223.

228 Organic Chemistry Laboratory 1(0,3)⁴ Continuation of CH 227. *Preq:* CH 227 and registration in CH 224.

229 Organic Chemistry Laboratory 1(0,3)³ A one-semester laboratory for chemical engineering students. *Preq:* CH 223.

313 Quantitative Analysis 3(3,0) The fundamental principles of volumetric, gravimetric and certain elementary instrumental chemical analyses. *Preq:* Registration in CH 315 or 317.

315 Quantitative Analysis Laboratory 2(0,6)⁵ The laboratory techniques of volumetric, gravimetric, and elementary instrumental analysis. *Preq:* Registration in CH 313.

317 Quantitative Analysis Laboratory 1(0,3)⁵ The standard techniques of analytical chemistry—gravimetric, volumetric, and instrumental. *Preq:* Registration in CH 313.

330 Introduction to Physical Chemistry 3(3,0)⁶ A one-semester treatment of physical chemistry which emphasizes topics that are especially useful in the life sciences, agriculture and medicine: Chemical thermodynamics, equilibrium, solutions, kinetics, electrochemistry, macromolecules, and surface phenomena. *Preq:* One semester of calculus.

331, 631 Physical Chemistry 3(3,0)⁶ Includes the gaseous state, thermodynamics, chemical equilibrium, and atomic and molecular structure, from both experimental and theoretical points of view. *Preq:* MTHSC 206, physics.

- 332, H332, 632 Physical Chemistry 3(3,0)** Continuation of CH 331, including chemical kinetics, liquid and solid state, phase equilibria, solutions, electrochemistry and surfaces.
- 339, 639 Physical Chemistry Laboratory 1(0,3)** Experiments are selected to be of maximum value to Chemistry and Chemical Engineering majors. *Preq:* Registration in CH 331.
- 340, 640 Physical Chemistry Laboratory 1(0,3)** Continuation of CH 339. *Preq:* Registration in CH 332.
- 402, H402, 602 Inorganic Chemistry 3(3,0)** Basic principles of inorganic chemistry are discussed with special emphasis on atomic structure, chemical bonding, solid state, coordination chemistry, organometallic chemistry and acid-base theories. The chemistry of certain selected elements is treated. *Preq:* CH 331, 332.
- 411, 611 Instrumental Analysis 4(2,6)** Demonstration and operation of modern optical and electronic precision-measuring devices as they apply to the processes of analytical, physical and organic chemistry. *Preq:* Physical chemistry.
- 413 Chemistry of Aqueous Systems 3(3,0)** Chemical equilibria in aqueous systems, especially natural waters; acids and bases, dissolved CO₂, precipitation and dissolution, oxidation-reduction, adsorption, etc. May be elected instead of CH 313 with consent of instructor. *Preq:* CH 223, 224.
- 421, H421, 621 Advanced Organic Chemistry 3(3,0)** Survey of modern organic chemistry with an emphasis on synthesis and mechanisms. *Preq:* CH 224, 332, or equivalent.
- 427, 627 Organic Spectroscopy 3(2,3)** Survey of modern spectroscopic techniques used in the determination of molecular structure. Emphasis is on the interpretation of spectra: nuclear magnetic resonance, ultraviolet, infrared, mass spectroscopy, optical rotatory dispersion and circular dichroism. *Preq:* One year each of organic chemistry and physical chemistry.
- 435, H435, 635 Spectroscopy and Molecular Structure 3(3,0)** Molecular spectroscopy and structure as elucidated by elementary quantum mechanics. Topics covered include Planck's black-body radiation formulation leading to the quantum concept, solution of Schrodinger's equation for single systems, microwave spectroscopy, infrared and Raman spectroscopy, Fourier transformed spectra, electronic spectra and structure, and elementary statistical thermodynamics. *Preq:* CH 331, 332, MTHSC 208.
- 441 Glass Manipulation 2(0,6)** A course designed to teach the fundamentals of glass manipulation and its application to the construction and repair of simple laboratory apparatus.
- 443 Research Problems 3(0,9)** Original investigation of an assigned problem in a fundamental branch of chemistry. This work must be carried out under the supervision of a member of the staff. *Preq:* Senior standing in Chemistry or consent of instructor.
- 444 Research Problems 3(0,9)** Continuation of CH 443.
- 454, H454, 654 Chemical Synthesis 3(1,6)** Designed to introduce the student to modern research techniques in inorganic and organic chemistry. Experiments to be carried out involve the synthesis of various types of compounds by diverse experimental techniques. Modern instrumental methods will be used to characterize the products. *Preq:* Organic chemistry.
- 491, H491, 691 Introduction to Radiochemistry 3(2,3)** Study of natural and synthetic isotopes, including atomic and nuclear structures, properties of radiation, tracer techniques and applications. The laboratory includes methods of detection and measurement of radiation, and applications of tracer techniques. *Preq:* Senior or graduate standing, consent of instructor.
- 700 Physical Science in Elementary School—Chemistry 3(2,3)**
- 701 Review of General Chemistry 3(3,0)**
- 702 Chemistry for High School Teachers 3(2,3)**
- 703 Special Problems in Chemistry for Elementary and Secondary School Teachers 3-6(2-6,6-0)**
- 804 Fundamental Principles of Inorganic Chemistry 3(3,0)**

¹Credit toward a degree will be given for only one of the following: CH 102 or 112.

²Credit toward a degree will be given for only one of the following: CH 201 or 223.

³Credit toward a degree will be given for only one of the following: CH 225, 227, or 229.

⁴Credit toward a degree will be given for only one of the following: CH 226 or 228.

⁵Credit toward a degree will be given for only one of the following: CH 315 or 317.

⁶Credit toward a degree will be given for only one of the following: CH 330 or 331.

- 805 Theoretical Inorganic Chemistry 3(3,0)
806 Physical Methods in Inorganic Chemistry 3(3,0)
807 Chemistry of the Transition Elements 3(3,0)
808 Chemistry of the Nonmetallic Elements 3(3,0)
811 Analytical Chemistry 3(3,0)
812 Chemical Spectroscopic Methods 3(2,3)
814 Electroanalytical Chemistry 3(2,3)
816 Separation Science 3(3,0)
821 Organic Chemistry I 3(3,0)
822 Organic Chemistry II 3(3,0)
824 Fundamental Principles of Polymer Chemistry 3(3,0)
825 Chemistry of Heterocyclic Compounds 3(3,0)
830 Fundamentals of Physical Chemistry 3(3,0)
831 Chemical Thermodynamics 3(3,0)
834 Statistical Thermodynamics 3(3,0)
835 Chemical Kinetics 3(3,0)
837 Quantum Chemistry 3(3,0)
840 Techniques of Experimental Chemistry 3(1,6)
851 Seminar 0-2
861 Principles of Biochemistry 3(3,0)
891 Master's Research. Credit to be arranged.
900 Advanced Topics in Inorganic Chemistry 1-4(1-4,0)
910 Special Topics in Analytical Chemistry 1-4(1-4,0)
920 Advanced Topics in Organic Chemistry 1-4(1-4,0)
930 Advanced Topics in Physical Chemistry 1-4(1-4,0)
991 Doctoral Research. Credit to be arranged.

CIVIL ENGINEERING (CE)

Professors: S. C. Anand, R. H. Brown, *Head*; J. E. Clark, R. E. Elling, W. B. Ledbetter, J. C. McCormac, R. F. Nowack, A. E. Schwartz, B. L. Sill, P. R. Sparks, P. B. Zielinski, *Associate Professors:* W. Baron, J. L. Burati, E. J. Hayter, J. L. Josey, C. H. Juang, D. B. Stafford; *Assistant Professors:* S. Amirkhanian, N. M. Aziz, A. Fiuzat; *Adjunct Professors:* C. Lindbergh, H. C. Saxe; *Adjunct Associate Professor:* T. J. Anessi; *Adjunct Assistant Professors:* W. H. Dallis, Jr., M. H. Woo

201 Surveying 3(2,3) Elementary plane surveying for civil engineering and other students whose curriculum requires a basic knowledge of surveying. Coverage includes measurement of distance, angles and elevations, stadia, topography, area and volume calculations, construction surveying. Field exercises provide practice in the use of surveying instruments. *Preq:* MTHSC 106.

205 Civil Engineering Computer Applications 3(3,0) Advanced FORTRAN programming for practical problems in civil engineering and micro-computer word processing, spreadsheets, and CAD packages. *Preq:* ENGR 180.

301, H301 Structural Analysis 3(3,0) Analysis of statically determinate structural elements and systems. Influence lines for beams and trusses. Calculation of rotations and deflections by moment area, conjugate beam and unit load methods. Moment distribution and introduction to other methods of indeterminate analysis. Use of microcomputers for the analysis of trusses, continuous beams, and frames. *Preq:* CE 205, EM 304.

302 Structural Steel Design 3(3,0) Design of steel tension members, beams, columns, beam-columns and connections by working stress method. Introduction to plastic analysis and design. Emphasis on AISC specification. *Preq:* CE 301.

310 Transportation Engineering 4(3,2) Planning, location, design, operation, and administration of highways, railroads, airports and other transportation facilities, including economic considerations, pavement design, and digital computer applications to geometric and earthwork computation. *Preq:* CE 201.

320 Introduction to Construction Materials 3(2,3) Basic properties of portland cement and bituminous asphalt. Classification of aggregates on the basis of strength and size distribution. Mix design procedures, field control, and adjustments. Properties of fresh mixes and hardened concrete. Behavior of other construction materials including metals, composites, and plastics. Field trips to nearby plants. *Preq:* EM 305.

324 Introduction to Construction Engineering 3(3,0) Survey of the principal methods and equipment used in the construction industry. Critical path methods, construction equipment, and construction management practices are included. *Preq:* Junior standing.

330 Soil Mechanics 4(3,3) Mechanical and physical properties of soils and their relation to soil action in problems of engineering, such as classification, permeability, shearing strength consolidation, stress distribution and failure analysis of soils. *Preq:* EM 304 and Junior standing.

402, H402 Reinforced Concrete Design 3(3,0) Analysis and design of reinforced concrete beams, columns, footings, and one-way slabs using the strength design methods. Includes a brief introduction to the analysis and design of beams with the working stress method. *Preq:* CE 301.

403, 603 Use of Computers in Structural Analysis and Design 3(3,0) Analysis and design of statically determinate and indeterminate structural systems through the use of computers. Emphasis is placed on use of available computer programs likely to be used in industry. *Preq:* CE 301.

404, 604 Masonry Structural Design 3(3,0) Fundamentals of masonry materials, construction, structural systems. Application of structural design principles to multistory structures. Lateral load resisting shear walls, loadbearing walls, columns and pilasters, connections. *Preq:* CE 402.

405, 605 Structural Systems Design 3(3,0) Study of physical properties and mechanical response of engineered structural systems. Analytical and approximate methods of structural analysis are used to generate comparative structural performance data. *Preq:* CE 302. *Coreq:* CE 402 or consent of instructor.

410, 610 Traffic Engineering Operations 3(3,0) Basic characteristics of motor-vehicle traffic; high-way capacity applications of traffic control devices; traffic design of parking facilities; engineering studies, traffic safety; traffic laws and ordinances; public relations. *Preq:* CE 310.

412, 612 Urban Transportation Planning 3(3,0) Urban travel characteristics; characteristics of transportation systems; transportation and land-use studies; trip distribution and trip assignment models; city patterns and subdivision layout. *Preq:* CE 310.

417, 617 Airphoto Interpretation I 3(2,3) A brief review of the basic geometry of aerial photographs, characteristics of geologic and topographic features identifiable from aerial photographs, and site characteristics related to soil profile. Laboratory work includes soil mapping, selection of construction sites, and location of soil deposits for engineering purposes. *Preq:* Junior standing.

419, 619 General Photogrammetry 3(2,3) Fundamentals of mapping using aerial photographs; characteristics, production and use of aerial photographs; study of the operation of popular photogrammetric instruments including aerial cameras, stereoscopic viewing and plotting equipment; use of stereocomparagraph and multiplex plotting instruments; scale, tilt, and coordinate calculations; construction of photomosaics. *Preq:* Junior standing.

422, 622 Hydraulics and Hydrology 3(3,0) Concepts of open channel flow; flow measurement; hydraulic structures; hydraulic machinery, reservoirs and reservoir capacities; hydraulic transients; unsteady flow; study of precipitation; runoff; hydrograph analysis; flood routing. *Preq:* CE 205, EM 320.

423, 623 Applied Hydrology 3(2,3) Introduction to the elements of occurrence of water; hydrologic cycle, rainfall runoff relations, evaporation, transpiration, streamflow; probability concepts in hydrology; flood routing; stormwater detention and conveyance systems; groundwater flow. Emphasis will be on application and design. The laboratory will include design of components of storm drainage or other water conveyance facilities. *Preq:* EM 320.

425 Engineering Relations 3(3,0) Business, legal, and ethical relations in engineering practice. *Preq:* Senior standing.

431, 631 Applied Soil Mechanics 3(2,2) Relationship of local geology to soil formations, ground-water, planning of site investigation, sampling procedures, laboratory determinations of design parameters, foundation design, and settlement analysis. *Preq:* CE 330.

432, 632 Construction Project Administration 3(3,0) Development of fundamental concepts involved in the technical management of the construction phase of engineering projects. *Preq:* CE 324 or equivalent.

433, 633 Construction Planning and Scheduling 3(3,0) Principles and applications of the Critical Path Method (CPM) and Project Evaluation and Review Techniques (PERT). Project breakdown and network graphics. Identification of the critical path and resulting floats. Definition and allocation of materials, equipment, and manpower resources. Resource leveling, compression, and other network adjustments. Computer applications using packaged routines. *Preq:* CE 324 or equivalent.

434, 634 Construction Estimating and Project Control 3(3,0) Specifications, contracts, and bidding strategies. Purchasing and subcontracting policies. Accounting for materials, supplies, subcontracts, and labor. Procedural details for estimating earthwork, reinforced concrete, steel, and masonry. Overhead and profit items. *Preq:* CE 324 or equivalent.

435, 635 Engineering Project Analysis 3(3,0) Advanced analysis of engineering projects. Theory of economic, financial and intangible analysis of large-scale construction projects. Practical exercises in cost-benefit studies and construction decisions. *Preq:* Consent of instructor.

438, 638 Construction Support Operations 3(3,0) Description of activities necessary for the completion of a construction job although not specifically recognized as direct-construction activities. General conditions, safety, security, quality assurance, value engineering. Organizational support features and typical implementation procedures. *Preq:* CE 324 or equivalent.

439, 639 Construction Equipment Selection and Maintenance 3(3,0) Methodology of selecting the right equipment of the right size for each task of the construction job on the basis of power-train characteristics, crew size, terrain conditions, and job requirements. Cycle time, cost, specifications, maintenance, replacement policy, monitoring. *Preq:* CE 324 or equivalent.

453, 653 Structural Analysis II 3(3,0) Analysis of statically indeterminate structures, including continuous beams, trusses and frames by virtual work, Castigliano's theorems, three-moment equation, moment distribution, and slope deflection. Influence lines for statically indeterminate structures. Muller-Breslau principle. Approximate methods for indeterminate frames. Solution of indeterminate trusses and frames using microcomputers. Introduction to matrix structural analysis. *Preq:* CE 205, 301.

462, 662 Coastal Engineering I 3(3,0) Introduction to coastal and oceanographic engineering principles, including wave mechanics, wave-structure interaction, coastal-water level fluctuations, coastal-zone processes, and design considerations for coastal structures and beach nourishment project. *Preq:* EM 320.

464, 664 Physical Models in Fluid Mechanics 3(2,2) Classical techniques of dimensional analysis and similitude are presented for fluid mechanics problems with actual construction of an operating physical model to solve a practical engineering problem. Problem will be chosen from the areas of coastal engineering, waste heat disposal, water quality, and river mechanics. Experimental design and instrumentation will be covered in detail. *Preq:* EM 320.

480, 680 Wind Engineering 3(2,2) Study of the effects of wind forces on buildings, bridges, and other structures, including meteorological aspects of wind generation, aerodynamics of flow around buildings, structural responses and environmental flows. *Preq:* CE 301, EM 320.

482, 682 (ESE) Groundwater and Contaminant Transport 3(3,0) See ESE 482.

490, H490, 690 Special Projects 1-3(1-3,0) Studies or laboratory investigations on special topic in civil engineering field which are of interest to individual students and staff members. Arranged on a project basis with a maximum of individual student effort and a minimum of staff guidance. *Preq:* Senior standing.

801 Matrix Methods of Structural Analysis 3(3,0)

802 Prestressed Concrete Analysis and Design 3(3,0)

803 Reinforced Concrete Structural Systems 3(3,0)

804 Theory of Plates and Shells 3(3,0)

- 805 Plastic Analysis and Design of Steel Structures 3(3,0)
- 806 Metal Compression Members 3(3,0)
- 807 Numerical and Approximate Methods in Structures 3(3,0)
- 808 Finite Element Method in Engineering 3(3,0)
- 810 Dynamic Analysis of Structures 3(3,0)
- 811 Highway Geometric Design 3(2,3)
- 812 Airphoto Interpretation II 3(2,3)
- 813 Highway and Airport Pavement Design 3(3,0)
- 814 Traffic Flow Theory 3(3,0)
- 815 Transportation Safety Engineering 3(3,0)
- 816 Highway Planning 3(3,0)
- 817 Mass Transit Planning 3(3,0)
- 818 Airport Planning and Design 3(3,0)
- 819 Transportation Research 2-4(2-4,0)
- 823 Asphalt Concrete Properties 3(3,0)
- 824 Construction and Performance of Concrete 3(3,0)
- 830 Advanced Soil Mechanics 3(3,0)
- 831 Foundation Engineering 3(3,0)
- 832 Reliability Analysis and Design in Civil Engineering 3(3,0)
- 833 Analysis and Design of Deep Foundations 3(3,0)
- 835 Construction Project Modeling 3(3,0)
- 837 Construction Specifications and Contracts 3(3,0)
- 840 Project Management Applications 3(3,0)
- 846 Flow in Open Channels 3(3,0)
- 850 Theory of Plates and Shells 3(3,0)
- 852 (EM) Finite Element Analysis 3(3,0)
- 860 Advanced Fluid Mechanics 3(3,0)
- 861 Mechanics of Sediment Transport 3(2,2)
- 862 Heat Transfer at Water Surfaces 3(3,0)
- 863 Coastal Engineering II 3(3,0)
- 865 Hydrologic Systems Analysis 3(3,0)
- 866 Advanced Hydrologic Systems Analysis 3(3,0)
- 871 Coastal Hydrodynamics 3(3,0)
- 872 Marine Pollution Control 2(2,0)
- 875 Numerical Models and Hydraulics 3(3,0)
- 889 Special Problems I 1-3(1-3,0)
- 890 Special Problems II 1-3(1-3,0)
- 891 Master's Research. Credit to be arranged.
- 893 Selected Topics in Civil Engineering 1-6(1-6,1-6)
- 991 Doctoral Research. Credit to be arranged.

CLEMSON/FURMAN (CF)

- 801 Research and Communication 3(3,0)
- 802 Managerial Economics 3(3,0)
- 803 Statistical Analysis of Business Operations 3(3,0)
- 804 Managerial Accounting and Information Systems 3(3,0)
- 805 Legal and Social Environment of Business 3(3,0)
- 806 Operations Management 3(3,0)

- 807 (FIN) Financial Management 3(3,0)
- 808 Managerial Problems in Marketing 3(3,0)
- 809 Organization Theory and Behavior 3(3,0)
- 810 Managerial Policy 3(3,0)
- 811 International Business Management 3(3,0)
- 812 Financial Markets and Institutions 3(3,0)
- 813 Industrial Relations 3(3,0)
- 814 Directed Research in Quantitative Analysis 3(3,0)
- 815 Directed Research in Qualitative Analysis 3(3,0)
- 816 Economics of Property Rights 3(3,0)
- 817 Business Forecasting Techniques and Applications 3(3,0)
- 821 Business Taxation 3(3,0)
- 822 Corporate Financial Reporting 3(3,0)
- 823 International Accounting 3(3,0)
- 830 Investment Management 3(3,0)
- 831 Computer-Assisted Financial Management 3(3,0)
- 889 Organization Design and Theory 3(3,0)
- 890 Topics in Strategic Management 3(3,0)

COACHING EDUCATION (CED)

Assistant Professor: R. D. Hefley

351 Scientific Basis and Physiological Foundations of Coaching 3(3,0) Designed to increase understanding of basic scientific information concerning athletic performance by utilizing the conceptual approach. Study of basic scientific principles of physiology and how they can be applied to conditioning programs for the athlete. Phases or physical training are covered along with evaluation of modern training devices. Not open to students who have taken CED 341. *Preq:* BIOL 103 and 105 or consent of instructor.

352 Scientific Basis and Kinesiological Foundations of Coaching 3(3,0) Designed to increase the student's understanding of basic scientific information concerning athletic movement by utilizing the conceptual approach. Deals with the basic laws of human motion necessary in evaluation of athletic movement, utilizing joint structure and anatomic landmarks as a basis for motion. *Preq:* CED 351 or consent of instructor.

353 Theory of Prevention and Treatment of Athletic Injuries 3(2,3) Designed to increase the student's understanding of principles involved in the prevention and treatment of athletic injuries. Deals with basic anatomy, first aid, and diagnostic techniques necessary for the understanding of basic athletic training procedures. *Preq:* CED 351 and 352 or consent of instructor.

361 Administration and Organization of Athletic Programs 3(3,0) Study of modern techniques and practices used in administering athletic programs. Major emphasis areas such as practice and game organization, purchase and care of equipment, budget and finances, public relations, and legal liability in athletic programs are presented.

362 Psychology of Coaching 3(3,0) Study of psychological techniques utilized to promote maximum athletic performance. Areas of emphasis include motivation, coaching philosophy, athletic personality, mental preparation, and goal-oriented behavior. Not open to students who have taken CED 342. *Preq:* ED 302 or PSYCH 201 or consent of instructor.

371 Coaching Baseball 1(0,3) Designed to increase understanding of basic technical and practical information concerning the coaching of baseball by utilizing the conceptual approach. Students will study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Total program development will also be covered as it pertains to specific level of competition. *Preq:* CED 351 or consent of instructor.

372 Coaching Basketball 1(0,3) Designed to increase understanding of basic technical and practical information concerning the coaching of basketball by utilizing the conceptual approach.

Students will study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Total program development will also be covered as it pertains to specific levels of competition. *Preq:* CED 351 or consent of instructor.

373 Coaching Cross Country 1(0,3) Designed to increase understanding of technical and practical information concerning the coaching of cross country by utilizing the conceptual approach. Students will study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Total program development will also be covered as it pertains to specific levels of competition. *Preq:* CED 371 or consent of instructor.

374 Coaching Football 1(0,3) Designed to increase understanding of basic technical and practical information concerning the coaching of football by utilizing the conceptual approach. Students will study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Total program development will also be covered as it pertains to specific levels of competition. *Preq:* CED 351 or consent of instructor.

375 Coaching Soccer 1(0,3) Designed to increase understanding of basic technical and practical information concerning the coaching of soccer by utilizing the conceptual approach. Students will study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Total program development will also be covered as it pertains to specific levels of competition. *Preq:* CED 351 or consent of instructor.

376 Coaching Strength and Conditioning 1(0,3) Designed to increase understanding of basic technical and practical information concerning the coaching of strength and conditioning by utilizing the conceptual approach. Students will study basic principles of coaching, training program, and equipment appraisal as a means to improve athletic performance. Total program development will also be covered as it pertains to specific levels of competition. *Preq:* CED 351 or consent of instructor.

377 Coaching Track and Field 1(0,3) Designed to increase understanding of basic technical and practical information concerning the coaching of track and field by utilizing the conceptual approach. Students will study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Total program development also will be covered as it pertains to specific levels of competition. *Preq:* CED 351 or consent of instructor.

378 Coaching Volleyball 1(0,3) Designed to increase understanding of basic technical and practical information concerning the coaching of volleyball by utilizing the conceptual approach. Students will study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Total program development will also be covered as it pertains to specific levels of competition. *Preq:* CED 351 or consent of instructor.

379 Coaching Wrestling 1(0,3) Designed to increase understanding of basic technical and practical information concerning the coaching of wrestling by utilizing the conceptual approach. Students will study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Total program development will also be covered as it pertains to specific levels of competition. *Preq:* CED 351 or consent of instructor.

COLLEGE OF EDUCATION (COLED)

480, 680 (AGED, ED, INED) Educational Applications of Microcomputers 3(3,0) Introductory computer literacy course for teachers. Computer-assisted instruction, software, hardware, and educational applications will be covered. *Preq:* Senior standing/graduate in Education.

482, 682 (AGED, ED, INED) Advanced Educational Applications of Microcomputers 3(2,2) Course is designed to provide students with the knowledge and skills needed to apply microcomputer technology to the utilization and generation of educational software in accordance with sound educational principles. *Preq:* COLED (AGED, ED, INED) 480.

COMMUNITY AND RURAL DEVELOPMENT (CRD)

(See courses listed under Agricultural Economics and Rural Sociology)

Professors: B. L. Dillman, M. S. Henry, J. C. Hite, E. L. McLean

357 Natural Resources Economics 3(3,0) The principles and problems involved in the use of soil, water, forest, and mineral resources, with special emphasis on economic aspects of alternative methods of resource utilization. *Preq:* AGECE 202, ECON 200 or 211.

411, 611 (AGEC) Regional Impact Analysis 2(2,0)F Techniques for analysis of the growth and decline of regions including economic-base theory, shift share, regional input-output, regional econometric models, and fixed impact models. *Preq:* AGECE 202 or ECON 211 and 212.

412, 612 (AGEC) Spatial Competition and Rural Development 2(2,0)S Development of rural activity in the context of historical, theoretical, and policy aspects of friction associated with spatial separation. Location factors, transfer costs, location patterns, and regional-growth policy are considered. *Preq:* AGECE 202 or ECON 212.

491 (AGEC) Internship, Agribusiness, and Community and Rural Development 1-6(0,2-12) Internship under faculty supervision in an approved agency or firm. An internship is designed to provide students with work experience in agribusiness or community and rural development. Student will submit a comprehensive report within one week of the end of the internship. A maximum of 6 internship credits may be earned. *Preq:* Junior standing and/or consent of instructor.

COMPARATIVE LITERATURE (CLIT)

403 Modern Studies 3(3,0) Comparative studies in modern literature. *Preq:* Two years study of a foreign language and six credits in literature.

COMPUTER ENGINEERING

(See Electrical and Computer Engineering)

COMPUTER SCIENCE (CPSC)

Professors: R. M. Geist III, S. T. Hedetniemi, E. W. Page III, J. C. Peck, A. J. Turner, Jr., *Head; Associate Professors:* H. C. Grossman, S. M. Hedetniemi, A. W. Madison, R. P. Pargas, D. E. Stevenson, J. M. Westall, Jr.; *Assistant Professors:* P. J. Bernhard, D. H. Hutchens, T. D. Korson, A. J. Offutt, D. J. Pokrass, M. K. Smotherman; *Instructor:* G. A. Tagliarini; *Lecturers:* A. C. Connor, E. O. Hare, C. F. Pellerin, H. A. Pellerin, H. C. Sellers; *Visiting Instructor:* J. W. Stamey

101, H101 Computer Science I 4(3,2) Introduction to modern problem solving and programming methods. Special emphasis is placed on algorithm development and software life cycle concepts. A general survey of basic hardware and software concepts is included. Intended for students who plan to concentrate in computer science or a related field. *Preq:* MTHSC 105 or satisfactory score (550) on the Mathematics Test, Level II (standard) or consent of instructor.

102, H102 Computer Science II 4(3,2) Continuation of CPSC 101, with continued emphasis on problem solving and program development techniques. Typical numerical, nonnumerical, and data processing problems will be examined. Basic data structures will be introduced. *Preq:* CPSC 101.

105 Computer Applications for Education Majors 1(0,2) Computer literacy, user environments, and software packages for education. Credit may not be received for both CPSC 105 and 120.

110, H110 Elementary Computer Programming 3(3,0) Introduction to computer programming and its use in solving problems, intended primarily for technical majors. The FORTRAN programming language will be used. (Credit may not be received for both CPSC 110 and 150.)

120 Introduction to Information Processing Systems 3(2,2) Introduction to the techniques, principles and concepts of modern information processing systems and microcomputers, intended primarily for nontechnical majors. Topics include information processing packages and applications, usage of typical information processing packages, digital computers, programming fundamentals and languages, and implementation of computer programs.

130 Data Processing with Cobol 3(3,0) Introduction to data processing techniques and applications. Emphasis is placed on the organization and processing of data files. The COBOL programming language is used. *Preq:* CPSC 110 or 120, or equivalent.

150 Introductory FORTRAN Programming 1(1,0) Introduction to computer programming in the FORTRAN programming language. Credit may not be received for both CPSC 110 and 150. *Preq:* Knowledge of a computer programming language.

151 Introductory PL/I Programming 2(2,0) Introduction to computer programming in the PL/I language. *Preq:* Knowledge of a computer programming language.

152 Introductory Pascal Programming 2(2,0) Introduction to computer programming in the Pascal language. *Preq:* Knowledge of a computer programming language.

- 154 Introductory Snobol Programming 1(1,0)** Introduction to computer programming in the Snobol language. *Preq:* Knowledge of a computer programming language.
- 155 Introductory RPG Programming 1(1,0)** Introduction to computer programming in the RPG language. *Preq:* Knowledge of a computer programming language.
- 156 Introductory Basic Programming 1(1,0)** Introduction to computer programming in the Basic language. *Preq:* Knowledge of a computer programming language.
- 157 Introduction to C Programming 1(1,0)** Introduction to computer programming in the C programming language. Credit may not be received for both CPSC 157 and 260. *Preq:* Knowledge of a computer programming language.
- 158 Introductory Modula-2 Programming 1(1,0)** Introduction to computer programming in the Modula-2 programming language. *Preq:* Knowledge of a high-level computer programming language.
- 210, H210 Programming Methodology 4(3,2)** Introduction to programming techniques and methodology. Topics include structured programming, stepwise refinement, program design and implementation techniques, modularization criteria, program testing and verification, basic data structures, and analysis of algorithms. Credit may not be received for both CPSC 102 and 210. *Preq:* CPSC 110 or 130, or ENGR 180, or equivalent.
- 230 Assembly Language Programming 3(3,0)** Introduction to computer organization, machine language, and assembly language programming. The organization, machine language and assembly language of the IBM 370 will be studied. *Preq:* CPSC 101 or 110, or equivalent.
- 231 Computer Science III 4(3,2)** Study of the machine architectures on which algorithms are implemented; requirements of architectures that support high-level languages, programming environments, and applications. *Preq:* CPSC 102 or 210; or equivalent.
- 240, H240 Introduction to Data Structures 3(3,0)** Basic concepts of data structures such as queues, stacks, and lists. Course includes the study of algorithms for the manipulation of data structures, the implementation of these algorithms in existing programming languages, and applications such as storage allocation and garbage collection. *Preq:* CPSC 102 or 210. *Coreq:* MTHSC 219.
- 241 Computer Science IV 4(3,2)** Study of the data structures and algorithms fundamental to computer science; abstract data-type concepts; measures of program running time and time complexity; algorithm analysis and design techniques. *Preq:* CPSC 102 or 210; or equivalent.
- 250 Advanced FORTRAN Programming 2(2,0)** Continuing study of programming and problem solving using the FORTRAN language. Topics such as the use of data files and plotting will be included. *Preq:* CPSC 110, 120, or 150; or equivalent.
- 251 Advanced PL/I Programming 2(2,0)** Study of the advanced features of the PL/I language. Topics such as file processing, dynamic storage allocation and compile-time facilities will be included. *Preq:* CPSC 151 or equivalent.
- 253 APL Programming 1(1,0)** Introduction to computer programming in the APL language. *Preq:* CPSC 210 or consent of instructor.
- 260 Production Systems Environment 3(3,0)** Introduction to the environment typically encountered in large-scale data processing applications. Topics include the use of control languages to schedule the execution of programs and manage files. (Credit may not be received for both CPSC 157 and 260.) *Preq:* CPSC 102 or 210.
- 330 Computer Systems Organization 4(3,2)** Introduction to the structure and programming of computer systems. Various hardware/software configurations are explored and presented as integrated systems. Topics include basic computer organization, input/output organizations, interrupt processing and system software. *Preq:* CPSC 230 and MTHSC 219.
- 331 Computer Systems Laboratory 1(0,2)** Introduction to the systems programming environment; languages and interfaces for programming operating systems tasks; use of the C programming language and UNIX Operating system. *Preq:* CPSC 231; or equivalent.
- 332 Computer Systems 3(3,0)** Introduction to the design, integration, and use of hardware and software components in standard computer systems. Emphasis will be placed on computer organization at the component level, interfacing, basic operating system functions, and system utilities. Credit may not be received for both CPSC 332 and 422. *Preq:* CPSC 230 and MTHSC 219; or equivalent.

350 Foundations of Computer Science 3(3,0) Development of the theoretical foundations of programming, algorithms, languages, automata, computability, complexity, data structures, and operating systems; a broad range of fundamental topics is consolidated and extended in preparation for further study. *Preq:* CPSC 241 or equivalent.

360 Peripherals and File Design 3(3,0) Study of peripheral devices and data management as a basis for the design of information systems. Traditional data processing applications will be presented and evaluated in terms of efficiency and effectiveness. Problems using standard file organization and access techniques will be assigned. *Preq:* CPSC 240 and 260 or consent of instructor.

361 Data Management Systems Laboratory 1(0,2) Introduction to mainframe environments typical of large-scale data processing applications; programming languages, control languages, and file utilities; use of COBOL language and IBM JCL. *Preq:* CPSC 102 or 210; or equivalent.

371 Systems Analysis 3(3,0) Incorporates a study of the decision-making process at all levels with the logical design of information systems. Extensive study of the system life cycle with emphasis on current as well as classical techniques for describing data flows, data structures, file design, etc. *Preq:* CPSC 360.

372 Introduction to Software Development 3(3,0) Techniques and issues in software design and development; tools, methodologies, and environments for effective design, development, and testing of software; organizing and managing the development of software projects. *Preq:* CPSC 241 or equivalent.

422, H422, 622 Introduction to Operating Systems 3(3,0) Detailed study of the management techniques for the control of computer hardware resources. Topics include interrupt systems, primitive level characteristics of hardware and the management of memory, processor, devices, and data. Credit may not be received for both CPSC 332 and 422. *Preq:* CPSC 230 and 360, or equivalent.

423, H423, 623 Implementation of Operating Systems 3(2,2) Detailed review of the implementation of an existing, multi-tasking operating system. Extension of concepts in laboratory to development and implementation of a system nucleus supporting multi-tasking and process coordination on an actual computer system. Emphasis is given to design decisions as they apply to performance and complexity. *Preq:* CPSC 332 or 422, or equivalent.

428, H428, 628 Design and Implementation of Programming Languages 3(3,0) Overview of programming language structures and features and their implementation. Control and data structures found in various languages will be studied. Runtime organization and environment and implementation models will also be included. *Preq:* CPSC 230 and 240 or equivalent.

429, H429, 629 Translation of Programming Languages 3(3,0) Techniques and considerations for compiling and interpreting programming languages. Topics include scanning, parsing, optimization, code generation and their theoretical foundations. The implementation of a compiler or a major component of a compiler normally will be a term project. *Preq:* CPSC 422, 428.

430, 630 Computer Performance Evaluation 3(3,0) Computer hardware and software measure and evaluation in selection and improvement. Topics include measurement tools, analytic and simulation models, workload models, and program performance. *Preq:* CPSC 332 or 422 and MTHSC 301; or equivalent.

435, 635 Microprogramming 3(3,0) Software development at the microprogram level. Topics include organization of microprogrammed computers, emulation, interpreter design, and high-level language support. A survey of microprogrammable machines is also included. *Preq:* CPSC 330 and 422; or consent of instructor.

450, 650 Theory of Computation 3(3,0) Introduction to models of computation and machine description languages, including finite-state automata and regular expressions, pushdown automata and context-free languages, and Turing machines and recursive functions. Topics include equivalence and relative computing power of the models studied, enumeration, Church's thesis, and undecidability problems. *Preq:* ECE 352 or MTHSC 219 or consent of instructor.

462, H462, 662 Database Management Systems 3(3,0) Introduction to database/data communications concepts as related to the design of online information systems. Problems involving structuring, creating, maintaining and accessing multiple-user data bases will be presented and solutions developed. Comparison of several commercially available teleprocessing monitor and database management systems will be made. *Preq:* CPSC 360 and MTHSC 219.

- 463, 663 Online Systems 3(3,0)** Provides an indepth study of the design and implementation of transaction processing systems and an introduction to basic communications concepts. A survey of commercially available software and a project using one of the systems are included. *Preq:* CPSC 462.
- 464, 664 Introduction to Computer Architecture 3(3,0)** Survey of von Neumann computer architecture at the instruction-set level. Fundamental design issues will be emphasized and will be illustrated using historical and current mainframe, supermini, and micro architecture. *Preq:* CPSC 330 or consent of instructor.
- 472, 672 Software Development Methodology 3(3,0)** Advanced topics in software development methodology. Techniques such as chief programmer teams, structured design and structured walk-throughs will be discussed and used in a major project. The emphasis of this course is on the application of these techniques to large-scale software implementation projects. Additional topics such as mathematical foundations of structured programming and verification techniques will also be included. *Preq:* CPSC 240, 360.
- 480, 680 Fundamentals of Computer Science 3(3,0)** Fundamental concepts of computers and programming, intended primarily for Computer Science graduate students without an undergraduate degree in Computer Science. Topics include machine organization, assembly language programming systems, and data management. May not be taken by those who have completed CPSC 230. *Preq:* Expertise in programming in a high-level language and consent of instructor.
- 481, H481, 681 Special Topics in Computer Science 1-3(1-3,0)** Areas of computer science in which nonstandard problems arise. Innovative approaches to problem solutions which draw from a variety of support courses will be developed and implemented. Emphasis will be placed on independent study and projects. *Preq:* Consent of instructor.
- 491 Senior Seminar in Computer Science 1(1,0)** Series of seminars on professional and post-baccalaureate opportunities in computer science, new and emerging fields in computer research, interview techniques, professional development, ethics, social implications. To be taken Pass/Fail only. *Preq:* CPSC 360 or consent of instructor.
- 740 Computer Science for High School Teachers I 3(2,2)**
- 741 Computer Science for High School Teachers II 3(2,2)**
- 810 Introduction to Artificial Intelligence 3(3,0)**
- 820 Parallel Architectures, Languages, and Algorithms 3(3,0)**
- 823 Operating Systems Design 3(3,0)**
- 824 Advanced Operating Systems 3(3,0)**
- 825 Software Systems for Data Communications 3(3,0)**
- 827 Introduction to Formal Languages 3(3,0)**
- 828 Theory of Programming Languages 3(3,0)**
- 830 Systems Modeling 3(3,0)**
- 838 Advanced Data Structures 3(3,0)**
- 840 Design and Analysis of Algorithms 3(3,0)**
- 862 Database Management Systems Design 3(3,0)**
- 864 Computer Architecture 3(3,0)**
- 872 Software Design and Programming Methodology 3(3,0)**
- 873 Software Verification, Validation, and Measurement 3(3,0)**
- 881 Special Topics 1-3(1-3,0)**
- 888 Directed Projects in Computer Science 1-6**
- 891 Master's Research. Credit to be arranged.**
- 981 Seminar in Computer Science 1-3(1-3,0)**
- 991 Doctoral Research. Credit to be arranged.**

DAIRY SCIENCE (DYSC)

Professors: A. B. Bodine II, J. F. Dickey, B. F. Jenny; *Associate Professor:* D. D. Lee, Jr.,
Head; Assistant Professors: J. A. Bertrand, A. K. Greene, J. C. Hoskin, M. E. Richardson

101 Dairy Foods 1(1,0) Dairy foods such as ice cream, yogurt, and various cheeses; the use of these foods for nutrition and pleasure. Sampling of various products will take place throughout the course.

102 Mammalian Reproduction 1(1,0)S Physiology and endocrinology of the reproductive processes in male and female mammals with emphasis on farm animals. Control of reproductive cycles, diseases, sexuality, and effects of drugs on reproduction will be discussed.

201 Introduction to Dairy Science 3(3,0)F The basic principles of dairy production and manufacturing. Topics include the breeding, feeding, and management of dairy cattle, quality control of milk, and the processing of milk and dairy products.

203 Dairy Science Techniques 1(0,3)F Laboratories designed to demonstrate the basics of breeding, feeding, and management of dairy cattle, quality control of milk, and processing of milk and dairy products. *Preq:* To be taken concurrently or to follow DYSC 201.

304 Evaluation of Dairy Products 2(1,3)S Emphasis placed on sensory evaluation of dairy products. Discussion of basic principles of organoleptic evaluation, fundamental rules for scoring and grading dairy products. Evaluation of all classes of dairy products, based on established grades and score cards. *Preq:* Consent of instructor.

310 Dairy Cattle Selection 1(0,3)S Emphasis placed on the selection of dairy cattle for profitable herd operations. Evaluations of herd classification, fitting, showing, and true type are made.

400, 600 Cultured Dairy Products 3(2,3)S Alternate years. Basic principles of microbiological culture propagation, types of lactic cultures, their properties and uses; as well as processing procedures, quality control, and compositional and organoleptic characteristics of cultured dairy products will be discussed. The laboratory phase will include inplant experience with culture propagation and product manufacture. *Preq:* MICRO 305 or consent of instructor.

401 Special Problems 1-3(0,3-9) Problems of special interest to students in the junior or senior year. The course is designed to give experience with and independent study of selected dairy problems not covered in depth in other courses. May be repeated for a maximum of 6 credits. *Preq:* Consent of instructor.

402, 602 Dairy Manufacturers 3(2,3)F Alternate years. The principles and practice of the manufacture of ice cream and related dairy products; the principles of the manufacture of condensed and evaporated milks and milk powders; and the physical, chemical, and biological factors involved. *Preq:* Consent of instructor.

403, 603 Laboratory Techniques 3(2,3)F Research and quality control techniques commonly used in dairy science and related agri-sciences. *Preq:* CH 101, 102, or consent of instructor.

404, 604 Plant Management 2(2,0)S Alternate years. The organization and operation of dairy and food plants and the coordination of all functions into an orderly business enterprise. Emphasis will be given to management's responsibility concerning the procurement, processing, quality control and distribution of food products. Business and industrial techniques are used to develop maximum efficiencies.

407, H407, 607 Market Milk 3(3,0)F Composition, procurement, processing, distribution, quality control, public health aspects, basic chemistry and microbiology of industrial milk supplies and cultured products. *Preq:* DYSC 201 or consent of instructor.

409 Dairy Science Seminar 2(2,0)F Alternate years. Special research problems in production and manufactures are studied. Individual topics not fully covered in classwork are assigned for special report before class and members of Dairy Science staff.

452, 652 Dairy Cattle Feeding and Management 4(3,3)S Alternate years. Fundamental principles in the care, feeding, and management of dairy cattle of all ages. Topics include general consideration in selecting a breed and the individual cow, calf raising, growth and development of dairy heifers, care and management of the milking herd, and feeding for milk production. *Preq:* DYSC 201 or consent of instructor.

453, H453, 653 Animal Reproduction 3(3,0) F Reproductive physiology and endocrinology of mammals with emphasis on farm animals and frequent reference to reproduction in laboratory animals and humans. *Preq:* Consent of instructor.

455, 655 Animal Reproductive Management 1(0,3) Physiology and endocrinology of pregnant and nonpregnant cows are discussed. Emphasis is placed on methods of artificial insemination, pregnancy detection, and computer recordkeeping for achieving a high level of reproductive efficiency in cattle. *Preq:* To be taken concurrently or to follow DYSC 453.

461, 661 Physiology of Lactation 2(2,0) S Anatomy and development of the mammary gland; physiological and biochemical regulation of mammary growth and milk secretion with emphasis on farm animals and reference to other mammals. *Preq:* BIOCH 210, CH 223, or consent of instructor.

490 Practicum 1-4 Supervised dairy science learning opportunity, providing highly individualized experiences to complement other programs and courses. Must be prearranged at least two months in advance. Must file written report midway during enrollment period and at its conclusion. Must appear for oral evaluation at the end period. *Preq:* Sophomore standing and consent of instructor.

801 Topical Problems 1-3

803 Physiology of Reproduction and Milk Secretion 3(3,0)

808 Industrial Dairy Science 3(3,0)

820 Dairy Science Graduate Seminar 1(1,0)

891 Master's Research. Credit to be arranged.

ECONOMICS (ECON)

Professors: R. C. Amacher, D. K. Benjamin, D. W. Blair, R. D. Elliott, D. F. Gordon, C. M. Lindsay, R. E. McCormick, R. B. McKenzie, M. T. Maloney, *Head:* R. E. Meiners, A. H. Ringleb, R. D. Shannon, R. J. Staaf, G. R. Thompson, H. H. Ulbrich, M. S. Wallace, J. T. Warner, T. B. Yandle, Jr.; *Associate Professors:* W. R. Dougan, F. L. Edwards, D. N. Laband, C. Nardinelli; *Assistant Professors:* C. A. Diamond, Jr., M. S. Gerety, D. L. Placone, R. D. Sauer, Jr., C. J. Simon; *Instructors:* J. B. Bill, B. W. Hetherington, I. Jans; *Lecturers:* R. E. Gregory, T. N. Patrick, Jr., E. M. Young; *Visiting Assistant Professor:* D. C. Baker-White

101 Economics in Our Times 1(1,0) A nontechnical introduction to economics based on an examination of current issues and problems for students who have not taken ECON 200, 211, or 212. Does not count toward the requirements of the major or minor in Economics.

200 Economic Concepts 3(3,0)¹ Comprehensive course including both micro- and macro-economic concepts for the student not having theoretical course requirement beyond the principles level or for the student expecting to take a selected group of the 300-level courses in economics.

203 Consumer Economics 2(2,0) Presentation of information and material to facilitate consumer decision making in such areas as home finance, insurance, banking, investments, taxation, budgeting and other areas of immediate concern to the American consumer.

211, H211 Principles of Economics 3(3,0) Intensive study of the economics of the firm, pricing of resources, and international economic relations. Theory is given relevance through the analysis of current economic problems.

212, H212 Principles of Economics 3(3,0) Fundamental principles of pricing, stabilization, and growth in a modern economy. Topics include supply and demand, employment theory and fiscal policy, banking systems and monetary policy, and economics of growth.

301 Economics of Labor 3(3,0) Economics of the labor market, the problems of the industrial worker, and the methods of adjusting labor-management disputes. *Preq:* ECON 200 or 211, 212.

302, H302 Money and Banking 3(3,0) Considers the function of money and banking in both the product and financial markets. Special emphasis is placed on monetary theory and current problems of monetary policy. *Preq:* ECON 211 and 212, or 200 and consent of instructor.

304 (FIN) Risk and Insurance 3(3,0) See FIN 304.

305 (FIN) Investment Analysis 3(3,0) See FIN 305.

308 Collective Bargaining 3(3,0) Practices, procedures, legal foundations, and legal structure associated with collective bargaining. Form and content of the labor contract, grievance machinery, and mediation and arbitration institutions will also be studied. *Preq:* ECON 200 or 211.

309 Government and Business 3(3,0) Relationships between government and business, including among other topics, government efforts to enforce competition; to regulate public utilities; and to protect the special interest of laborers, farmers, and consumers. *Preq:* ECON 200 or 211.

310 The International Economy 3(3,0) Study of the process of international commerce among nations. Covers basic theory of trade and exchange rates, institutional and legal environment, current policy issues. Not open to students in the College of Commerce and Industry or students who have taken ECON 412. *Preq:* ECON 200 or 211.

311, 611 (MASC) Introduction to Econometrics 3(3,0) Elements of time series analysis and introduction to the measurement, specification, estimation and interpretation of functional relationships through single equation least square techniques. Problems of multicollinearity, dummy variables, heteroscedasticity, autocorrelation, and lagged variables in simple economic models are introduced. *Preq:* ECON 314, MTHSC 301.

314, H314 Intermediate Economic Theory 3(3,0) Analytical study of the basic concepts of value and distribution under alternative market conditions. *Preq:* ECON 211 and 212, or 200 and consent of instructor.

403, 603 Development of Economic Thought 3(3,0) Study of the origin and evolution of economic ideas with some emphasis on historical context, problems which inspired these ideas, and nature of the solutions which they provided from ancient days to the present. *Preq:* ECON 200 or 211, 212.

404, 604 Comparative Economic Systems 3(3,0) A comparative analytical and historical study of the principal economic systems which have been important in the modern world including among others, capitalism and socialism. *Preq:* ECON 200 or 211.

407, H407, 607 National Income and Employment Analysis 3(3,0) Macroeconomic problems of inflation and unemployment form the focal points. Statistics (GNP and the Consumer Price Index) and theory (Classical, Keynesian, and Monetarist views) will be included. Pertinent public policies designed to deal with these problems will be analyzed. *Preq:* ECON 200 or 212.

408, 608 Arbitration 3(3,0) Analysis of dispute settlement procedures with specific emphasis on mediation, factfinding, and arbitration as they are used to resolve labor-management disputes in the public and private sectors. *Preq:* Consent of instructor.

409, 609 (MGT) Managerial Economics 3(3,0) Use of tools of economic analysis in classifying problems, in organizing and evaluating information, and in comparing alternative courses of action. Bridges the gap between economic theory and managerial practices. *Preq:* MASC 310 or ECON (MASC) 311, or consent of instructor.

410, 610 Economic Development 3(3,0) Consideration and analysis of economic and related problems of the underdeveloped countries. Attention will be given to national and international programs designed to accelerate solution of these problems. *Preq:* ECON 200 or 211, 212.

412, H412, 612 International Trade and Finance 3(3,0) Analysis of the principles governing trade between nations. Topics include trade theory, comparative advantage, theory and practice of commercial policy, balance of payments, determination of exchange rates, interaction of foreign and domestic sectors, price and income effects of trade, multinational corporations, and economic integration. *Preq:* ECON 211 and 212, or consent of instructor.

419, 619 Economics of Defense 3(3,0) Examines the American defense establishment in terms of resources utilized, alternative uses, and the contribution to the national economy and scientific progress generated by resources in a defense use. Discussed are economic problems inherent in shifting resources between defense and nondefense uses and among alternative defense uses. *Preq:* ACCT 200 or 201, ECON 200 or 211.

420, H420, 620 Public Sector Economics 3(3,0) Study of the role of government and its proper functions and limitations in a market. Provision of goods and services by all levels of government and instruments of taxation are evaluated according to efficiency and equity criteria. Contemporary public sector issues are emphasized throughout. *Preq:* ECON 314 or consent of instructor.

421, 621 Urban Economics 3(3,0) Economic problems associated with the concentration of population in central places are examined. Economic reasons for the development of cities are studied and models of urban location and growth are analyzed. A major emphasis of the course is on the identification and evaluation of alternative solutions to urban economic problems. *Preq:* ECON 200 or 211, 212.

- 422, H422, 622 Monetary Theory and Policy 3(3,0)** An intensive study of the role of monetary factors in economic change. Modern monetary theories and their empirical relevance for policy are developed against a background of monetary history and institutions. *Preq:* ECON 302 or consent of instructor.
- 424, H424, 624 The Organization of Industries 3(3,0)** Empirical, historical, and theoretical analyses of market structure and concentration in American industry: the effects of oligopoly, monopoly, and cartelization upon price, output and other policies of the firm; antitrust and other public policies and problems will be studied. *Preq:* ECON 314 or consent of instructor.
- 430 Mathematical Economics 3(3,0)** Traditional economic theories are derived using elementary mathematics. Major emphasis is placed upon microtheoretical models. Specialized topics such as cartel theory, national income analysis, price discrimination, and optimization theory over time will be economically analyzed, using mathematical tools. *Preq:* ECON 314, MTHSC 106.
- 498, H498 Current Topics in Economics 3(3,0)** Discussion of current topics and research methods in economics. Students will write several short papers on current issues. *Preq:* Consent of instructor.
- 499, H499 Senior Seminar in Economics 3(3,0)** Discussion of topics of current interest in economics. Students will do directed research on a particular topic. *Preq:* Consent of instructor.
- 750 Economic Concepts and Classroom Applications for Teachers 3(3,0)**
- 751 Current Issues in Economics for Teachers 3(3,0)**
- 801 Microeconomic Theory 3(3,0)**
- 802 Advanced Economic Concepts and Applications 3(3,0)**
- 805 Macroeconomic Theory 3(3,0)**
- 807 (MASC) Econometric Methods I 3(3,0)**
- 808 (MASC) Econometric Methods II 3(3,0)**
- 809 Mathematical Economics 3(3,0)**
- 812 History of Economic Thought 3(3,0)**
- 816 Labor Economics 3(3,0)**
- 817 Public Employee Labor Relations 3(3,0)**
- 820 Public Sector Economics 3(3,0)**
- 824 Organization of Industry 3(3,0)**
- 825 Economics of Environmental Quality 3(3,0)**
- 826 Economic Theory of Government Regulation 3(3,0)**
- 827 Economics of Property Rights 3(3,0)**
- 831 Seminar in Urban Development Economics 3(3,0)**
- 840 International Trade Theory 3(3,0)**
- 841 International Finance 3(3,0)**
- 850 Monetary Theory 3(3,0)**
- 855 Financial Economics 3(3,0)**
- 888 Directed Reading in Economics 1-3(1-3,0)**
- 891 Master's Research. Credit to be arranged.**
- 900 Seminar in Advanced Economic Theory 3(3,0)**
- 901 (AGEC) Price Theory 3(3,0)**
- 902 (AGEC) Production Economic Problems 2(2,0)**
- 903 (AGEC) General Equilibrium and Welfare Theory 3(3,0)**
- 904 (AGEC) Seminar in Resource Economics 3(3,0)**
- 905 (AGEC) Advanced Macroeconomic Issues 3(3,0)**
- 906 (AGEC) Seminar in Area Economic Development 3(3,0)**
- 907 (AGEC) Agricultural Marketing Problems 2(2,0)**
- 917 (AGEC) Advance Seminar in Labor Economics 3(3,0)**
- 991 (AGEC) Doctoral Research. Credit to be arranged.**

EDUCATION (ED)

Professors: I. C. Briscoe, E. B. Galloway, G. W. Gray, E. J. Kozma, W. H. Leonard, J. E. Matthews, E. F. Olive, R. K. Peden, W. W. Pennscott, J. H. Walker; *Associate Professors:* D. E. Barrett, A. D. Brooks, S. L. Buckner, A. M. Derr, W. R. Fisk, D. L. Fuhr, B. L. Griffin, R. P. Green, Jr., *Acting Head:* J. V. Hamby, L. B. Hart, D. F. Keller, J. C. Richardson, V. B. Stanley; *Assistant Professors:* M. S. Crosby, G. F. Elrod, R. D. Hefley, R. A. Marion, R. M. Moore, K. S. Neal, C. L. Peters, M. C. Rhyne, B. T. Rogers, C. G. Weatherford; *Lecturers:* C. R. Boyte, N. S. Wilkinson

100 Orientation 1(1,0) Lectures and discussions on teaching in addition to serving as teacher aides. Required of all students in Early Childhood Education, Elementary Education, Secondary Education, and Science Teaching.

101 Reading Improvement 1(0,3) Provides an individualized approach to developmental reading skills emphasizing comprehension, vocabulary, and rate.

102 Efficient Reading 1(0,3) Extends the reading skills of vocabulary, comprehension, and rate stressing skimming, scanning, flexibility, and critical reading.

103 Study Techniques 1(0,3) Aims at individual study skills in the content areas and makes application by using these techniques in college curricula. Priority given to freshmen.

234 Introduction to Addictions: Basic Education and Prevention 3(3,0) Designed to give the student a basic review of addictions and chemical dependence and to give future educators skills in the identification of chemical abuse, techniques for intervention, and methods of prevention education. SOC 395 is recommended as a follow-up course for those interested in pursuing the topic.

301, H301 Principles of American Education 3(3,0) Study of the legal basis, historical development, characteristics, and functions of educational institutions in the United States.

302, H302 Educational Psychology 3(3,0) The nature, capacities, equipment, growth, and development of the learner.

315 (INED) Integrating Computers into the Classroom 1(0,2) Student will learn how to use microcomputers to supplement the classroom curriculum and to enhance classroom management. *Preq:* Admission to the College of Education; ED 301 and 302; fulfillment of the College of Education computer science requirement; or consent of instructor.

321 Physical Education for Elementary School: Games and Sports Skills 3(3,0) Values, purposes, and uses of creative games and games of low organization. Basic skills and lead-up activities for children. Methods of instruction and time allotments appropriate for elementary school programs. *Preq:* Junior standing Education major or consent of instructor.

334, H334 Child Development 3(3,0) Study of the physical and emotional growth and development of the child. *Preq:* ED 100, a minimum grade-point ratio of 1.8, or consent of instructor.

335, H335 Adolescent Growth and Development 3(3,0) The physical and emotional growth and development of the adolescent.

336 Behavior of the Preschool Child 3(2,3) Study of the behavior of the preschool child, including observation and participation. *Preq:* ED 334, a minimum grade-point ratio of 1.8, or consent of instructor.

400 Early Childhood Field Experience 1(0,3) Designed to provide practical classroom experience in early childhood education prior to the student teaching semester for the Early Childhood Education major. For a twelve-week period, students will spend two hours per week in schools observing, tutoring, conducting small group activities, and teaching the class. To be taken Pass/Fail only. *Preq:* ED 100, 334, 336, concurrent enrollment in ED 461, Junior standing, and minimum grade-point ratio of 2.0.

401 Elementary Field Experience 1(0,3) Designed to provide practical classroom experience prior to the student teaching semester for the Elementary Education major. For a twelve-week period, students will spend two hours per week in schools observing, tutoring individuals, conducting small group activities, and teaching the class. To be taken Pass/Fail only. *Preq:* ED 100, 334, concurrent enrollment in ED 461, Junior standing, and a minimum grade-point ratio of 2.0.

406, 606 Philosophy, Schooling, and Educational Policy 3(3,0) Analysis of the development of contemporary educational theory and its impact on current schooling practices and educational policy development.

412 Directed Teaching in Secondary School Subjects 12(1,33) A program of supervised observation and teaching in cooperation with selected public schools in which opportunities are provided for prospective teachers to obtain experiences in the subject area. Students to be sectioned according to teaching fields: English, history, social science, mathematical sciences, modern languages, science. Enrollment is limited.

414, 614 (PRTM) Recreation and Leisure for Special Populations 3(3,0) See PRTM 414.

424 Methods and Materials in Secondary English 3(3,0) Development of instructional practices and materials appropriate for secondary English; familiarization with curriculum materials; includes field experiences in local schools in preparation for student teaching. *Preq:* Second semester Junior standing and 2.0 grade-point ratio.

425 Methods and Materials in Secondary Modern Language 3(3,0) Development of instructional practices and materials appropriate for secondary modern languages; familiarization with curriculum materials; includes field experiences in local schools. *Preq:* Second semester Junior standing and 2.0 grade-point ratio.

426 Methods and Materials in Secondary Mathematics 3(2,2) Development of instructional practices and materials appropriate for secondary mathematics; familiarization with curriculum materials; includes field experiences in local schools. *Preq:* Second semester Junior standing and 2.0 grade-point ratio.

427 Methods and Materials in Secondary Science 3(2,2)F Development of instructional practices and materials for teaching secondary school science (biological, earth and physical sciences); familiarization with secondary science curriculum materials; includes field experiences in local schools. *Preq:* Second semester Junior standing and 2.0 grade-point ratio.

428 Methods and Materials in Secondary Social Studies 3(3,0) Development of instructional practices and materials appropriate for secondary social studies; familiarization with curriculum materials; includes field experiences in local schools in preparation for student teaching. *Preq:* Second semester Junior standing and 2.0 grade-point ratio.

429, 629 Teacher As Manager 3(3,0) Course designed to help teachers, principals, and other school personnel solve school problems by identifying and applying selected management techniques, and to better prepare educators for added responsibilities demanded of them by the movement to measurable improvement in their management of learning.

431, 631 Special Institute Course: Early Childhood Education 1-3(1-3,0) Subject areas organized according to institute needs.

432, 632 Special Institute Course: Elementary School 1-3(1-3,0) Subject areas organized according to institute needs.

433, 633 Special Institute Course: Secondary School 1-3(1-3,0) Subject areas organized according to institute needs.

434, 634 Special Institute Course: Current Problems in Education 1-3(1-3,0) Subject areas organized according to institute needs.

435, 635 Special Institute Course: Curriculum 1-3(1-3,0) Subject areas organized according to institute needs.

436, 636 Special Institute Course: Supervision and Administration 1-3(1-3,0) Subject areas organized according to institute needs.

458 Health Education 3(3,0) Study of the information needed for effective cooperation with parents, physicians and public health agencies in the promotion and improvement of community health, including problems of personal hygiene, health records, immunization, and control of communicable disease.

459 Fundamental Skills for Reading Instruction 3(2,2) Study of language development, preschool and primary reading process, historical development of reading, and basic skills. Laboratory field experiences to be arranged with each individual.

461, 661 Teaching Reading in the Elementary School 3(3,0) Study of the various phases of reading and their relation to the elementary program. Emphasis on modern practices in the classroom teaching of reading. *Preq:* ED 301, 302, 336 (for Early Childhood majors), Junior standing, and a grade-point ratio of 2.0.

462 Diagnostic and Corrective Reading 3(2,3) The purpose of this course is to prepare the prospective classroom teacher for diagnosing and correcting reading problems. Laboratory field experiences will be arranged for each individual. *Preq:* ED 461 or consent of instructor, Senior standing, and a minimum grade-point ratio of 2.0.

466 Introduction to Early Childhood Education 3(3,0) Introductory course for Early Childhood Education, which includes an overview of curriculum for kindergarten and primary grades. *Preq:* ED 336 or concurrent enrollment, Junior standing, and a minimum grade-point ratio of 2.0.

469, 669 Characteristics of Children with Emotional Handicaps 3(3,0) Intensive study of the meaning and concepts associated with emotionally handicapped. Analysis of the causes and characteristics of emotionally handicapped. *Preq:* ED 302, or PSYCH 201 and ED 471, or consent of instructor.

470, 670 Characteristics of Children with Learning Disabilities 3(3,0) Nature and extent of perceptual, motor, and conceptual impairments are examined. Team functions, community role, and family needs are emphasized. *Preq:* ED 302, ED 471 and PSYCH 201, or consent of instructor.

471, H471, 671 The Exceptional Child 3(3,0) Survey of exceptionality including handicapped and gifted children; nature, cause, and treatment of difficulties; educational problems.

472, 672 Psychology of Mental Retardation 3(3,0) Psychological aspects of mental retardation: learning, motivation, and personality development.

473, 673 Teaching the Mentally Retarded 3(3,0) Study, selection, and preparation of curricular materials; methods of teaching retarded children within the preadolescent and adolescent range. *Preq:* ED 472 or equivalent.

474, 674 Educational Procedures for Children with Emotional Handicaps 3(3,0) Major problems of teaching disturbed children: curriculum and instructional modifications, program planning, facility adaptation, behavior controls, articulation with mental health specialists, and procedures to develop readiness for return to regular class. *Preq:* ED 302, ED 471 and PSYCH 201, or consent of instructor.

475, 675 Educational Procedures for Children with Learning Disabilities 3(3,0) Special emphasis is given to educational evaluation and remedial procedures designed to improve the individual's learning abilities. A multisensory approach is emphasized geared to individual need. *Preq:* ED 302, ED 471 and PSYCH 201, or consent of instructor.

476, 676 Practicum in Learning Disabilities 3(2,3) Designed to provide practical experience in teaching the learning disabled under the supervision of college faculty and local teachers of learning disabilities. *Preq:* ED 470, 471, 475, or consent of instructor.

477, 677 Characteristics of Children Who Are Gifted 3(3,0) Course designed to acquaint the student with definitions, incidences, characteristics, identification procedures, and curriculum options for the gifted. *Preq:* ED 471.

478, 678 Practicum in Emotionally Handicapped 3(2,3) Designed to provide practical experience in teaching the emotionally disturbed under the supervision of college faculty and local teachers of emotionally handicapped. *Preq:* ED 469, 471, 474, or consent of instructor.

479, 679 Practicum in Mentally Retarded 3(2,3) Designed to provide practical experience in teaching the mentally retarded under the supervision of college faculty and local teachers of mentally retarded. *Preq:* ED 471, 472, 473, or consent of instructor.

480, 680 (AGED, COLED, INED) Educational Applications of Microcomputers 3(3,0) See COLED 480.

481 Directed Teaching in the Elementary School 12(1,33) Supervised observation and teaching experiences in cooperation with selected elementary schools. Enrollment is limited to seniors or graduates who have completed prerequisite courses. *Preq:* ED 462, 485, 487, 488, Senior standing, a minimum grade-point ratio of 2.0, and consent of area coordinator.

482, 682 (AGED, COLED, INED) Advanced Educational Applications of Microcomputers 3(2,2) See COLED 482.

483 Methods and Materials for Early Childhood Education 3(3,0) Study of methods and materials applicable to nursery schools, kindergarten, and early elementary grades. *Preq:* ED 466, concurrent enrollment in ED 461, Junior standing, and a minimum grade-point ratio of 2.0.

484 Directed Teaching in Early Childhood Education 12(1,33) Supervised observation and teaching experiences in cooperation with nursery, kindergartens, and early elementary schools. Enrollment is limited to seniors or graduates who have completed prerequisite courses and have the accumulated grade-point ratio for graduation. *Preq:* ED 462, 466, 483, 488, Senior standing, a minimum grade-point ratio of 2.0, and consent of the area coordinator.

485 Methods and Curriculum in Elementary Mathematics and Science 3(3,0) Development of understanding, skills, and attitudes in the elementary mathematics and science curricula, with emphasis on strategies, techniques, and materials for teaching elementary mathematics and science. *Preq:* MTHSC 115, 116, 216, completion of the 12-hour science requirement, Junior standing, and a minimum grade-point ratio of 2.0.

487 Teaching Social Studies in the Elementary School 2(2,0) Provides the preservice teacher with an introduction to the skills of social studies and methods, materials, and techniques needed to teach these skills to students in the elementary school. *Preq:* HIST 172, 173, and the social science requirement.

488 Teaching the Language Arts in the Elementary School 3(3,0) Provides the preservice teacher with an introduction to the skills of the language arts other than reading and the methods, materials, and techniques needed to teach these skills to students in the elementary school. *Preq:* ED 301 and 302, ENGL 101 and 102, Junior standing, and grade-point ratio of 2.0.

490, 690 Student Management and Discipline 3(3,0) Designed to aid preservice and inservice teacher development and refine knowledge, skills, and values important for managing students in school settings. Practical application of theory and research and legal and ethical considerations will be emphasized. *Preq:* ED 302 or PSYCH 201 and ED 334 or 335 or suitable alternative.

497, 697 Audio-Visual Aids in Education 3(3,0) Techniques and uses of audio-visual aids in improving teaching effectiveness.

498, H498 Secondary Content Area Reading 3(1,4) Designed for preservice teachers who are involved with field experiences prior to student teaching full time. The course is designed to prepare content area teachers to teach the reading skills necessary for effective teaching of content area material. *Preq:* For students enrolled in professional block semester.

700 (INED) Supervising the Student Teacher in the Public School 2-3(2-3,0)

705 Foundations of Counseling and Guidance Services 3(3,0)

707 Reading and Independent Study in Education 1-3

720 School Personnel Administration 3(3,0)

721 Legal Phases of School Administration 3(3,0)

723 Field Experiences in Elementary Administration and Supervision 3(1,6)

724 Field Experiences in Secondary Administration and Supervision 3(1,6)

725 Practicum in School System Administration and Supervision 3(1,6)

740 Curriculum Planning for Early Childhood Education 3(3,0)

741 Introduction to Pupil Personnel Services in Higher Education 3(3,0)

742 Psychology of Post-Secondary Populations 3(3,0)

759 Fundamentals of Basic Reading 3(3,0)

760 Curriculum Development in the Elementary School 3(3,0)

761 Reading Instruction in the Elementary School 3(3,0)

762 Reading Diagnosis and Remediation 3(2,3)

763 Middle School Reading 3(3,0)

764 The Role of the Library in the Reading Program 3(3,0)

765 Secondary School Curriculum 3(3,0)

770 Methods for Science Laboratory Instruction 3(3,0)

794 School and Community Relationships 3(3,0)

- 798 Teaching Secondary School Reading 3(3,0)
- 801 Seminar in Human Growth and Development 3(3,0)
- 802 Human Development: Psychology of Learning 3(3,0)
- 803 Advanced Methods of Teaching in the Secondary School 3(3,0)
- 804 Advanced Methods of Teaching in the Elementary School 3(3,0)
- 805 The Two-Year College 3(3,0)
- 808 Educational Tests and Measurements 3(3,0)
- 809 Analysis of the Individual 3(3,0)
- 810 Theories and Techniques of Counseling 3(3,0)
- 811 School Finance 3(3,0)
- 812 The Counselor as Consultant 3(3,0)
- 813 Educational and Vocational Informational Service and Placement 3(3,0)
- 814 Field Experiences in Elementary School Guidance I 3(1,6)
- 815 Field Experiences in Secondary School Guidance I 3(1,6)
- 816 Field Experiences in Counseling in Post-Secondary Settings I 3(1,6)
- 817 Development of Counseling Skills 3(3,0)
- 818 Field Problems in School Administration and Instruction 3(2,3)
- 820 Teaching Language Arts to the Exceptional Child 3(3,0)
- 821 Assessment of the Exceptional Child 3(3,0)
- 822 Teaching Mathematics to the Exceptional Child 3(3,0)
- 823 Mainstreaming the Handicapped 3(3,0)
- 824 Secondary Curriculum Adaptations for the Handicapped 3(3,0)
- 825 Career-Vocational Education for the Handicapped 3(3,0)
- 828 Field Experiences in Elementary School Guidance II 3(1,6)
- 829 Field Experiences in Secondary School Guidance II 3(1,6)
- 830 Techniques of Supervision: The Public Schools 3(3,0)
- 832 Field Experiences in Counseling in Post-Secondary Settings II 3(1,6)
- 834 Educational Evaluation 3(3,0)
- 835 Field Experiences in Counseling in Community Agency Settings I 3(1,6)
- 836 Field Experiences in Counseling in Community Agency Settings II 3(1,6)
- 840 Program Development and Implementation in Early Childhood Education 3(2,2)
- 841 Advanced Studies in Teaching Secondary School English 3(3,0)
- 842 Advanced Studies in Teaching Secondary School Mathematics 3(3,0)
- 843 Advanced Studies in Teaching Secondary School Science 3(3,0)
- 844 Advanced Studies in Teaching Secondary School Social Studies 3(3,0)
- 846 Current Literature in English Education 3(3,0)
- 847 Current Literature in Mathematics Teaching 3(3,0)
- 848 Current Literature in Science Teaching 3(3,0)
- 849 Current Literature in Social Studies Teaching 3(3,0)
- 850 Public School Administration 3(3,0)
- 853 Administration and Supervision of Special Education 3(3,0)
- 854 Advanced Educational Leadership: Theory and Practice 3(3,0)
- 855 Business Management in Education 3(2,3)
- 856 Introduction to School Building Planning 3(2,2)
- 857 Selected Topics in Educational Administration 1-3(1-3,0)
- 861 Organization and Supervision of Reading Programs 3(3,0)
- 862 Clinical Research in Reading 3(3,0)

- 863 Practicum in Reading 3(2,2)
- 864 Special Problems in Reading Education 1-3(1-3,0-4)
- 865 Advanced Diagnosis and Remediation in Reading 3(2,3)
- 866 The Psychology of Teaching Reading 3(3,0)
- 867 Advanced Practicum in Reading 3(2,3)
- 868 Teaching Reading Through a Literature Emphasis 3(3,0)
- 869 The Reading-Writing Connection: An Integrated Approach 3(3,0)
- 871 Interpersonal and Group Relationships 3(3,0)
- 881 Individual Testing I 3(3,0)
- 882 Psychoeducational Evaluator Internship I 3(0,6)
- 883 Psychoeducational Evaluator Internship II 3(0,6)
- 884 School Psychology 3(3,0)
- 885 Individual Testing II 3(3,0)
- 886 Individual Testing III 3(3,0)
- 887 Psychoeducational Internship III 3(1,6)
- 889 (AGED, INED) Research in Education 3(3,0)
- 891 Master's Research. Credit to be arranged.
- 894 Directed Research 1-4

ELECTRICAL AND COMPUTER ENGINEERING (ECE)

Professors: A. W. Bennett, C. M. Butler, T. L. Drake, A. L. Duke, D. J. Dumin, L. T. Fitch, B. E. Gilliland, J. N. Gowdy, *Acting Head:* J. L. Hammond, J. W. Harrison, J. W. Lathrop, J. F. Leathrum, J. Y. Luh, J. D. Spragins; *Associate Professors:* E. G. Baxa, Jr., J. E. Bennett, M. A. Bridgwood, A. S. Collins, A. A. Girgis, J. J. Komo, E. B. Makram, H. V. Poe, K. F. Poole, R. J. Schalkoff, F. R. Sias, Jr., J. W. Silvestro, R. W. Snelsire, Y. Zheng; *Assistant Professors:* R. J. McDonald, D. W. Tipper, A. E. Turner, J. E. Wilbur, X. Xu; *Lecturers:* D. McAuliff, E. L. Sheppard

201 Logic and Computing Devices 3(1,4) Study of logic with an introduction to Boolean algebra. Number systems and representation of information. The use of integrated circuits to implement combinational and sequential logic functions and computing elements. The organization and structure of computing systems. *Preq:* Sophomore standing.

202, H202 Electric Circuits I 3(3,0) DC resistive circuits, Kirchhoff's Laws, Nodal and Mesh emphasis, sources, Thevenin's and Norton's theorems, RC, RL, RCL circuit solutions with initial condition using homogenous or nonhomogenous ordinary differential equations having constant coefficients. Develop sinusoidal steady state solution. *Preq:* MTHSC 108, PHYS 221. *Coreq:* ECE 203, MTHSC 208.

203 Electrical Circuits Laboratory I 1(0,2) Laboratory course designed to accompany ECE 202. Introduction to basic electrical circuits and instrumentation. *Coreq:* ECE 202.

204 Circuit Analysis Problems I 1(0,3) Analysis and solution of electrical network problems using mesh and nodal analysis, Thevenin's and Norton's theorems and equivalent circuits and other circuit analysis from ECE 202. *Coreq:* ECE 202.

250 Principles of Digital Computer Systems 3(2,2) Introduction to minicomputers and microcomputers. Topics include machine organization and operation, information flow within a machine, data types and structures, data transfers and communication with external devices, computer response time, interrelation between software and hardware, memory types, specifying cost-effective small computer systems, application examples, introductory assembly language programming. *Preq:* ECE 201, ENGR 180 or equivalent.

301, H301 Electric Circuits II 3(3,0) Continuation of the study of electric circuits, including three-phase circuits, complex frequency and network functions, frequency response, two-port parameters, magnetically-coupled circuits, Laplace transforms, and introduction to Fourier series and transforms. *Preq:* ECE 202, MTHSC 208. *Coreq:* ECE 303.

302 Linear Control Systems 3(3,0) Introduction to linear control systems. Topics include plant representation, applications of state variables, time and frequency response, stability, system specification, and system design. *Preq:* ECE 301.

303 Electrical Circuits Laboratory II 1(0,2) A laboratory course designed to accompany ECE 301. Characteristics of circuits. *Coreq:* ECE 301.

304 Circuit Analysis Problems II 1(0,3) Analysis and solution of AC excited electric network problems using methods of ECE 202 and 301. Use of step and impulse input functions. *Coreq:* ECE 301, MTHSC 208.

307 Basic Electrical Engineering 2(2,0) A first course in electrical engineering to provide non-Electrical Engineering majors with a knowledge of electric circuit theory, both DC and AC. The last five weeks of the semester are devoted to an introduction to digital systems. *Preq:* MTHSC 206, PHYS 221. *Coreq:* ECE 309.

308 Electronics and Electromechanics 2(2,0) Continuation of ECE 307. Energy conversion systems are considered, as well as basic electronics, plus instrumentation with emphasis on digital methods. *Preq:* ECE 307. *Coreq:* ECE 310.

309 Electrical Engineering Laboratory I 1(0,2) A laboratory designed to accompany ECE 307. Basic electrical circuits and instrumentation. *Coreq:* ECE 307.

310 Electrical Engineering Laboratory II 1(0,2) A laboratory designed to accompany ECE 308. Basic electronics and energy conversion. *Coreq:* ECE 308.

317 Random Analysis of Electrical Systems 3(3,0) Introduction to engineering problems of a probabilistic nature. Problems will be solved which utilized the concepts of probability space and functions of random variables. *Preq:* MTHSC 206.

320, H320 Electronics I 3(3,0) Introduction to electronic materials and devices. Principles of design. Design of dc circuits using diodes, bipolar junction transistors and field-effect transistors. *Preq:* ECE 202, MTHSC 208, PHYS 221.

321, H321 Electronics II 3(3,0) Analysis and design of discrete amplifier circuits at low and high frequencies. Operational amplifiers, distortion in amplifiers, oscillator design, circuit analysis of active digital devices. *Preq:* ECE 320. *Coreq:* ECE 326.

326 Electronics Laboratory I 1(0,2) Laboratory designed to accompany ECE 321. Characteristics of different amplifier configurations. *Preq:* ECE 320. *Coreq:* ECE 321.

329 Computer Systems Structures 3(3,0) Fundamental structures and issues that arise in the analysis and implementation of computer systems. Topics include operating systems structures and data structures and their relationship to computer organization. Engineering science background for computer systems design. *Preq:* CPSC 210, ECE 250.

330, H330 Electrical Systems Analysis 3(3,0) Study of continuous and discrete signals and systems applicable to circuits and control systems. Fourier series and Fourier transforms for continuous and discrete signals and systems. Amplitude, frequency, and pulse modulation. Continuous time and discrete time filtering. *Preq:* ECE 301, MTHSC 208.

340 (PHYS) Electromagnetics I 2(2,0) Introduction to electrostatics with applications. Vector analysis, Coulomb's law and forces, electric field, Gauss's law, dielectrics, electric potential, Laplace's equation and solutions. *Preq:* MTHSC 208, PHYS 221.

341, H341 (PHYS) Electromagnetics II 2(2,0) Introduction to magnetostatics and electrodynamics with application. Steady electric current, Ohm's law, Joule's law, Ampere's force law, magnetic forces and field, Biot-Savart's law, Boundary conditions, magnetic materials, inductance, magnetic circuits, Faraday's law, electromotive force, Maxwell's equations, electromagnetic waves. *Preq:* ECE 202, 340.

350 Mini-Micro Computer Programming 3(2,2) In-depth study of software design and implementation as applicable to mini- and micro-computers. Topics include assembly language programming; use of editors, loaders, monitors, etc.; data structure fundamentals and software design methodologies. *Preq:* ECE 250.

351 Real-Time Application of Digital Computers 3(2,2) Application and operation of digital computers in a real-time or time-critical environment. Topics include interrupt facilities, analog-to-digital and digital-to-analog signal conversion, digital computer interfaces, on-line acquisition and

reduction of data. Software concepts include multitask real-time executives, schedulers, and dynamic resource allocation systems. *Preq:* ECE 350.

352 Machines, Languages, and Algorithms 3(3,0) Topics fall into three major areas: discrete structures, formal languages, and finite state models. Emphasis is placed on relating formalisms to practical considerations such as logical design of digital machines and the limitations of machine computation. *Preq:* Junior standing in engineering or the physical sciences, or consent of instructor.

360, H360 Electric Power Engineering 3(3,0) Course presents the basic principles of electromagnetic induction and electromagnetic forces developed, synchronous machines, power transformers, electric power transmission and distribution systems, DC motors, induction motors. *Preq:* ECE 301 and PHYS 221.

402 Engineering Projects 1(0,2) Knowledge and skills needed by electrical engineers to function as a project leader or team member in an industrial environment. Topics considered include project proposals, planning, operation, and reports. Case studies and role-playing methods of instruction are used. *Preq:* Senior standing in Electrical and Computer Engineering or consent of instructor.

403, 603 Energy Conversion 3(3,0) Various methods of energy conversion with emphasis on solar energy which includes conversion techniques, storage, applications, systems, and future trends. Other energy conversion methods including fuel cells, magnetohydrodynamics, and nuclear are covered. *Preq:* MTHSC 208, PHYS 222. *Coreq:* MTHSC 311, 434, or consent of instructor.

404, 604 Semiconductor Devices 3(3,0) Consideration of the principles of operation, external characteristics, and applications of some of the more important semiconductor devices presently available. *Preq:* ECE 320. *Coreq:* MTHSC 311 or 434.

405, H405 Design Projects in Electrical and Computer Engineering 1-3(0,2-6) Individually defined projects oriented toward providing experience in establishment of objectives and criteria, synthesis, analysis, construction, testing, and evaluation. Development of student creativity through the solution of open-ended problems. Individual instruction in design methodology. Maximum of 3 credit hours. *Preq:* ECE 330, consent of project supervisor.

406, 606 Introduction to Microelectronics Processing 3(3,0) Microelectronic processing, MOS and bipolar monolithic circuit fabrication, thick and thin film hybrid fabrication, applications to linear and digital circuits, fundamentals of device design. *Preq:* ECE 320. *Coreq:* MTHSC 311 or 434.

407, 607 VLSI Reliability 3(3,0) Reliability concepts applied to VLSI components. Methods of reliability determination, prediction, and attribute assessment. Failure analysis techniques. Wearout related failure mechanisms. Role of defects and electrical overstress in reliability. Reliability growth through design and process control. *Preq:* ECE 320. *Coreq:* MTHSC 311 or 434.

410, H410, 610 Introduction to Digital Control Systems 3(3,0) Introductory course in digital control theory with microprocessors and minicomputers applications: z-transforms, flow graphs, state variables, stability, system compensation using state variables, root locus, Nyquist's and Routh's criterion, optimal design. Introduction to minicomputer and microcomputer implementation of control algorithms. Computer I/O techniques for control applications, time-response limitations of transfer functions. *Preq:* ECE 302; MTHSC 311, 434, or 453.

411, 611 Electrical Systems 1(0,2) Experimental investigations in the areas of mathematical modeling, transient and steady-state responses of second and higher order systems, Bode plots, Nyquist's plots, modulation, system identification, and Pade's rational function approximations. *Coreq:* ECE 302, 422.

412 Electrical Machines Laboratory 1(0,2) Selected experiments which will help the student become familiar with characteristics of transformers, DC and AC motors and generators. Measurement techniques and components modeling will be included. *Coreq:* MTHSC 434 or consent of instructor. *Preq or Coreq:* ECE 360 or 419.

414, 614 Analysis of Robotic Systems 3(3,0) Analysis of methods of designing and operating robotic systems for the purpose of advanced automation. On-line identification and description of 3-D objects by digitized images. Off-line collision-free path planning and on-line collision-avoidance traveling using artificial intelligence. *Preq:* ECE 302 or consent of instructor.

417, 617 Software Design 3(3,0) Indepth study of methodologies and techniques used throughout the software development cycle including analysis, design, implementation, and testing. Additional topics include software development tools and software project management techniques. *Preq:* ECE 329, MTHSC 419.

418, 618 Power System Analysis 3(3,0) Study of power system planning and operational problems. Subjects covered are load flow, economic dispatch, fault studies, transient stability and the control of problems. System modeling and computer solutions are emphasized through class projects. *Preq:* ECE 360, ECE (PHYS) 341.

419, 619 Electric Machinery 3(3,0) Performance and characteristics of AC and DC machines during steady-state and transient conditions. Coverage includes DC, induction, synchronous motors and alternators. Modeling and computer simulation are included. *Preq:* ECE 360, ECE (PHYS) 341.

422, H422, 622 Operational Amplifier Circuits 3(2,2) Analysis and design of circuits, both analog and digital, using operational amplifiers. *Preq:* ECE 321. *Coreq:* MTHSC 311 or MTHSC 434.

423, 623 Power System Protection 3(3,0) Covers basic requirements of power system protection, relaying principles and the basic techniques of over current, distance, differential and carrier protection, computer coordination and introduction to digital protection are introduced. *Coreq:* ECE 418; MTHSC 434 or consent of instructor.

425, 625 Microcomputers Interfacing 3(2,2) Hardware characteristics of microcomputers. Design of microcomputer interfaces involving memory, parallel I/O, serial I/O, interval timers, priority interrupt controllers, DMA controllers. A/D and D/A conversion. Laboratory with individual hands-on design experience. *Preq:* ECE 250 or CPSC 230. *Coreq:* ECE 321.

426, 626 Digital Computer Design 3(3,0) Design of high-speed ALU's, control and timing circuitry, memory systems, and I/O circuitry; microprogrammed computer design using bit-slice microprocessors; current hardware topics related to computer design; hands-on design experience; and use of logic analyzer for system debugging. *Preq:* ECE 429.

428, 628 Modulation and Noise 3(3,0) Course covering the modulation techniques used in modern communication systems. Topics covered are spectral translations, stochastic description of signals and noise, correlation functions, power spectra, amplitude modulation, frequency and phase modulation, pulse amplitude modulation, and impact of noise on systems employing these types of modulation. *Preq:* ECE 330; ECE 317 or MTHSC 400; MTHSC 311, 434, or consent of instructor.

429, 629 Computer Organization 3(3,0) Course in computer organization and architecture. Topics include a review of logic circuits, bus structures, memory organization, interrupt structures, arithmetic units, input-output structures, state generation, central processor organization, control function implementation, and data communication. *Preq:* CPSC 230 or ECE 250, or consent of instructor.

430, 630 Digital Communications 3(3,0) Course in modern digital communications theory. Topics covered are discrete time signals, discrete Fourier transforms, channel bandwidth, channel distortion, coding of analog information, data signal encoding, introduction to decision theory, matched filter, baseband systems, AM, FM, PM, phase-locked loops, secure communications, and contemporary communications systems. *Preq:* ECE 317 or MTHSC 400, ECE 330, MTHSC 311 or 434, or consent of instructor.

431, 631 Digital Electronics 3(2,2) Electronic devices and circuits of importance to digital computer operation and to other areas of electrical engineering are considered. Active and passive wave-shaping, waveform generation, memory elements, switching, and logic circuits are some of the topics. Experimentation with various types of circuits is provided by laboratory projects. *Preq:* ECE 321. *Coreq:* MTHSC 311 or 434.

432, 632 Instrumentation 3(3,0) Theory and analysis of transducers and related circuits and instrumentation. Generalized configurations and performance characteristics of instruments will be considered. Transducer devices for measuring physical parameters such as motion, force, torque, pressure, flow, and temperature will be discussed. *Preq:* ECE 321. *Coreq:* MTHSC 311 or 434.

433, 633 Sensors and Microcomputer Control for Robots 3(1,4) Study of current robotics technology with emphasis on robots suitable for industrial applications that require locomotion and sophisticated sensors. Class design project will be coordinated to produce a working modular robot. *Preq:* ECE 425 or consent of instructor.

434, 634 Power Electronics 3(3,0) Study of electronic devices and systems which are designed to control or regulate large amounts of power. Included are SCR applications to inverters, motors controls, high-current power supplies, frequency converters, etc. High-current switching systems, voltage stabilizers, and other power applications of electronics are also considered. *Preq:* ECE 321, 360. *Coreq:* MTHSC 434 or consent of instructor.

435, 635 Optoelectronics 3(3,0) Understanding of the design aspects and physical phenomenon forming the basis for devices used in electro-optical systems is provided. Topics include LEDs, laser diodes, detectors, noise electro-optic devices, acousto-optic devices, and system aspects. *Preq:* ECE 320, ECE (PHYS) 340, 341. *Coreq:* MTHSC 311 or 434.

436, 636 Transmission Lines and Microwave Circuits 3(3,0) Study of the theoretical and practical aspects of transmission lines and waveguides. Smith Chart applications and impedance matching networks, scattering parameters, interconnection and design of multiports. *Preq:* ECE (PHYS) 341 or equivalent. *Coreq:* MTHSC 311 or 434.

437, 637 Laser Technology and Applications 3(3,0) Working knowledge of the underlying principles of the operation of lasers and their utilization in engineering systems is provided. The criterion for output power and wavelength are examined. Study of the characteristics of lasers that are pertinent to system design is stressed. *Preq:* ECE (PHYS) 340, 341, PHYS 222 and 442.

438, 638 Computer Communications 3(3,0) Digital data transmission techniques, modems and communications channels, communications software and protocols, multiprocessors and distributed processing. Concurrence and cooperation of dispersed processors. *Preq:* Senior standing in Electrical or Computer Engineering or Computer Science or consent of instructor.

439, 639 Fiber Optics 3(3,0) The underlying principles of design for optical fibers in practical systems is covered. Optical fiber as a waveguide is examined using wave optics and ray optics. Design criteria for using mono- and multi-mode fibers are discussed. Other topics include fabrication, measurement, packaging, and coupling of optical fibers. *Preq:* PHYS 222, ECE (PHYS) 340, 341. *Coreq:* MTHSC 311, 434, or consent of instructor.

440, 640 Performance Analysis of Local Computer Networks 3(3,0) Introduction to the design and performance analysis of local computer networks. Emphasis is placed on performance analysis or representative multiaccess procedures. Three common types of networks are considered in detail. *Preq:* ECE 317 or MTHSC 400; ECE 250 or equivalent.

441, 641 Theory of Sequential Machines 3(3,0) Introduction to the theory of computing covering the topics of sequential machines, sequential machine decomposition, formal language theory and Turing machines.

442, 642 Knowledge Engineering 3(3,0) Introduction to the theoretical and practical aspects of knowledge engineering or applied artificial intelligence. Topics to include symbolic representation structures and manipulation, unification, production systems and structures, rule-based and expert systems, planning and system architectures. System design in PROLOG and LISP. Project required. *Preq:* ECE 201; MTHSC 419 or consent of instructor. *Coreq:* ECE 329 or 429.

446, 646 Antennas and Propagation 3(3,0) Antenna design and utilization from the standpoint of transmission, reception and as a system component. Study of the theoretical and practical aspects of antenna design and utilization, input impedances, structural considerations and wave propagation. *Preq:* ECE 330, 436, ECE (PHYS) 341; MTHSC 311 or 434.

450, 650 Computer System Design Project 2(0,4) A project-oriented course which brings together computer engineering students into teams or project groups. Assignments are made to each group which are designed to help develop an appreciation for individual and creative thinking as well as team effort. *Preq:* ECE 321, 329, 330.

451, 651 System Design Project 2(0,4) A project-oriented course which brings together electrical engineering students of dissimilar training into teams or project groups. Assignments are made to each group which are designed to help develop an appreciation for individual and creative thinking as well as team effort. *Preq:* ECE 302, 321, 330.

452, 652 Programming Systems 3(3,0) A second course in programming languages and systems. Topics include assemblers, compilers and syntactical methods; string manipulation and list processing; concepts of executive programs and operating systems; introduction to time-sharing systems. *Preq:* ECE 329, MTHSC 419.

454, 654 Physiological Control Systems 3(2,2) Control theory will be introduced to the level that frequency domain analysis and computer simulation using CSMP can be used. Emphasis will be placed on computer modeling of the pulmonary, renal, hormonal, and cardiovascular systems. *Preq:* Senior standing or consent of instructor.

458, 658 Circuit Design of Modern Analog Filters 3(3,0) Review of the resistor op amp circuits, bilinear transfer functions, cascade design, biquadratic realizations, Butterworth and Chebyshev filters, sensitivity, frequency and network transformations, component and operational simulation of LC ladders, switched capacitor filters. *Preq:* ECE 301, 330. *Coreq:* ECE 302.

459, 659 Integrated Circuit Design 3(2,2) Design concepts and factors influencing the choice of technology. Fundamental MOS device design. Silicon foundries, custom and semicustom integrated circuits. Computer-aided design software/hardware trends and future developments. Hands-on use of CAD tools to design standard library cells. Systems design considerations, testing, and packaging. *Preq:* ECE 321. *Coreq:* MTHSC 311 or 434.

460, 660 Computer-Aided Analysis and Design 3(3,0) Principles and methods suited to the solution of engineering problems on the digital computer. Topics include widely used methods for the solution of the systems of algebraic and/or differential equations which arise in modeling of engineering systems, data approximation and curve fitting, continuous system simulation languages, and design-oriented programming systems. *Preq:* ECE 301; MTHSC 311, 434, or consent of instructor.

463, 663 Microcomputers 3(2,2) Single-chip microcomputers: hardware, software, interfacing. Systems design using currently available peripheral chips. Single-board computers. Detailed study of chip-slice microprocessors. Present and future trends in microcomputer hardware, software, and architecture. *Preq:* ECE 425.

467, 667 Introduction to Digital Signal Processing 3(3,0) Introduction to characteristics, design, and applications of discrete time systems. Design of digital filters. Introduction to the Fast Fourier Transform (FFT). LSI hardware for signal processing applications. *Preq:* ECE 330.

468, 668 The Embedded Microprocessor 3(2,2) Interfacing, architecture, and design issues which arise when the microprocessor is embedded in electromechanical and human systems. Applications and design projects include guidance systems, robotics, process control, artificial limbs, etc. *Preq:* ECE 330, 425; MTHSC 311, 434, or consent of instructor.

471, 671 Microcomputer Applications in Medical Instrumentation 3(3,0) Study of state-of-the-art techniques of analysis and monitoring in clinical and research environments. Electrocardiographic (ECG) and electroencephalographic (EEG) analysis and monitoring will be discussed in detail. Automation of other clinical facilities such as intensive care and the catheterization laboratory will be considered. Microcomputer design considerations will be emphasized. *Preq:* ECE 425 or equivalent microcomputer experience.

492, 692 Special Problems 1-3(0,2) Special assignment in electrical or computer engineering. Some typical assignments include computer programs, term papers, technical literature searches, hardware projects, and design project leadership. May be taken only once for credit.

493, 693 Selected Topics 1-3(1-3,0) Classroom study of current and new technical developments in electrical and computer engineering. *Preq:* Consent of instructor.

701 Master of Engineering Design Project 1-3

801 Analysis of Linear Systems 3(3,0)

802 Electric Motor Control 3(3,0)

803 Linear Control Theory and Design 3(3,0)

804 Methods of Applied Optimization and Optimum Control 3(3,0)

805 Methods of State and Parameter Estimation of Stochastic Systems 3(3,0)

806 Identification in Control 3(3,0)

807 Power System Analysis Techniques 3(3,0)

808 Self-Organizing Control 3(3,0)

809 Semiconductor Materials 3(3,0)

811 Integrated Circuit Design 3(2,2)

817 Power System Transients 3(3,0)

- 819 Detection and Estimation Theory 3(3,0)
- 820 Theory of Communications I 3(3,0)
- 821 Theory of Communications II 3(3,0)
- 822 Information Theory 3(3,0)
- 823 Integrated Circuit Technology 3(3,0)
- 825 Solid-State Electronics 3(3,0)
- 829 Quantum Electronics 3(3,0)
- 830 Electromagnetics 3(3,0)
- 831 Advanced Electromagnetic Theory 3(3,0)
- 832 Electromagnetic Measurements 3(3,0)
- 833 Integrated Optics and Beam Waveguides 3(3,0)
- 834 Asymptotic Methods and Diffraction Theory 3(3,0)
- 836 Microwave Circuits and Systems 3(3,0)
- 837 Antenna Theory 3(3,0)
- 838 Special Topics in Electromagnetics 1(1,0)
- 839 Integral Equations in Electromagnetics 3(3,0)
- 840 Physics of Semiconductor Devices 3(3,0)
- 841 Distributed Computing and Networks 3(3,0)
- 842 Computer Architecture 3(3,0)
- 843 Computer Graphics 3(3,0)
- 844 Digital Signal Processing 3(3,0)
- 845 Computer System Design and Operation 3(3,0)
- 846 Digital Processing of Speech Signals 3(3,0)
- 847 Digital Image Processing 3(3,0)
- 849 Advanced Topics in Computer Communications 3(3,0)
- 850 Computation and Simulation 3(3,0)
- 851 Advanced Topics in Computer Architecture 3(3,0)
- 852 Software Engineering 3(3,0)
- 853 Computer Data Displays 3(3,0)
- 855 Artificial Intelligence 3(3,0)
- 856 Pattern Recognition 3(3,0)
- 857 Coding Theory 3(3,0)
- 858 Automata Theory 3(3,0)
- 870 Biosystems Analysis 3(3,0)
- 890 Engineering Report Research. Credit to be arranged.
- 891 Master's Research. Credit to be arranged.
- 892 Special Problems in Electrical and Computer Engineering 1-3(1-3,0)
- 893 Selected Topics in Electrical and Computer Engineering 1-3(1-3,0)
- 991 Doctoral Research. Credit to be arranged.

ENGINEERING (ENGR)

Professor: W. F. Beckwith; *Associate Professor:* J. L. Josey

101 Introduction to Engineering 1(0,2) Introduction to engineering. Skills with dimensions, units, calculators, and technical communications are developed, and engineering ethics is emphasized. Career guidance is provided, including surveys of the professional fields of engineering, engineering curricula, and engineering departments.

110 Engineering Problems Workshop 1(0,2) Workshop devoted to the analysis and solution of engineering-oriented problems. Representative problems taken from the different fields of engineering will be used to illustrate such analytical and problem-solving techniques as estimation and approximation, numerical aids to computation, and solutions by graphical methods.

180 Computers in Engineering 3(2,3) Introduction to the use of computers in engineering analysis, design, and communications. A high-level programming language and other software are used on micro and mainframe computers. *Preq:* Engineering major; knowledge of a computer language. *Coreq:* MTHSC 106.

220 Technology in the Modern World 3(3,0) Designed for technical and nontechnical students to give an appreciation of the two-way interaction between technology and society. Historical, present, and projected topics will be included from a variety of disciplines. *Preq:* Sophomore standing in any college.

ENGINEERING GRAPHICS (EG)

Associate Professors: V. B. Anand, D. L. Ryan; *Assistant Professors:* N. M. Aziz, R. M. Bata

108 Microcomputer Graphics 1(0,2) Designed for the introduction of PC-based CADD interactive systems as a means of communication. Areas of study include laboratory experience with PC hardware, CADD packages, data entry, shell commands, entity manipulation, and display generation.

109 Engineering Graphics 2(1,3)¹ A course for the introduction of engineering graphics as a problem-solving tool. Areas of study include theory of orthographic points, lines, planes, and solids; sectional views; dimensioning; and design drawings.

208 Engineering Graphics with Computer Applications 3(2,3)¹ Course designed for the introduction of basic concepts in engineering graphics as a means of communication. Areas of study include theory of orthographic projections, descriptive geometry, and computer graphics. *Preq:* ENGR 180.

209 Introduction to Engineering/Computer Graphics 2(1,3)¹ Designed for the introduction of basic graphical concepts needed for engineering application, including orthographic projections, descriptive geometry, and computer graphics.

308 Computer-Aided Engineering Graphics 3(2,2) Continuation of EG 208 with emphasis on computer programming for graphics displays. *Preq:* EG 208 or consent of instructor.

411 Computer-Aided Process Planning—Graphics 3(3,0) This course introduces the student to the computer-aided processes used in the A&E office. It is designed to be compatible with current industrial practices, equipment, and procedures to produce construction drawings. *Preq:* Senior standing or consent of department head.

412, 612 Interactive Computer Graphics 3(3,0) Graphics hardware and display technology. Reduction and presentation of engineering data. Techniques of geometrical transformations, perspective and model manipulation. Methodology of computer-aided design. Application of higher-level software to engineering problems. *Preq:* EG 208 and MTHSC 208 or consent of instructor.

490, 690 Special Topics in Engineering and Computer Graphics 1-3(1-3,0) Comprehensive study of any computer-aided topic in engineering graphics not covered in other courses. May be repeated for a maximum of six credits. *Preq:* Consent of instructor.

823 Computer-Aided Geometric Modeling 3(3,0)

ENGINEERING MECHANICS (EM)

Professors: S. C. Anand, N. R. Bauld, Jr., R. H. Brown, W. E. Castro, R. E. Elling, J. G. Goree, E. H. Law, R. F. Nowack, B. L. Sill, P. R. Sparks; *Associate Professor:* J. E. Jackson, Jr.; *Assistant Professor:* J. M. Kennedy

201, H201 Engineering Mechanics: Statics 3(3,0) Forces and force systems and their external effect on bodies, principally the condition of equilibrium. The techniques of vector mathematics are employed, and the rigor of physical analysis is emphasized. *Preq:* PHYS 122. *Coreq:* MTHSC 206.

202, H202 Engineering Mechanics: Dynamics 3(3,0) Continuation of EM 201. The principal topics are kinematics and kinetics of particles and rigid bodies of finite size. Techniques of vector mathematics are employed. *Preq:* EM 201, MTHSC 206.

¹Credit toward a degree will be given for only one of the following: EG 109, 208, 209

304, H304 Mechanics of Materials 3(3,0) The relationships between external loads on solid bodies or members and the resulting internal effects and dimension changes, including the derivation of rational formulas for stresses and deformations and the identification and use of important mechanical properties of engineering materials. *Preq:* EM 201, MTHSC 206.

305 Mechanics of Materials Laboratory 1(0,3) Theoretical relationships considered in EM 304 are verified. Students observe the behavior under load and the failure of engineering materials; identify and evaluate mechanical properties of materials important to design and manufacturing processes; and are acquainted with various testing methods, testing machines, and instruments. *Preq:* Must be accompanied or preceded by EM 304.

320, H320 Fluid Mechanics 3(3,0) The behavior of fluids at rest or in motion, including the study of fluid properties. Emphasis is placed upon a rational, analytical approach from which are developed basic principles of broad applicability to all fields of engineering. *Preq:* EM 202.

322 Fluid Mechanics Laboratory 1(0,3) The principles developed in EM 320 are verified and demonstrated. Familiarization with orderly techniques in organizing and reporting results of experimental investigations and with the use of instruments and equipment is afforded. *Preq:* Must be accompanied or preceded by EM 320.

425, 625 Advanced Strength of Materials 3(3,0) Topics in strength of materials not covered in EM 304. Three-dimensional stress and strain transformations, theories of failure, shear center, unsymmetrical bending, curved beams, and energy methods. Other topics such as stress concentrations and fatigue concepts are treated as time permits. *Preq:* EM 304.

430, 630 Mechanics of Composite Materials 3(3,0) Fundamental relationships for predicting the mechanical and thermal response of multi-layered materials and structures are developed. Micromechanical and macromechanical relationships are developed for laminated materials with emphasis on continuous filament composites. The unique nature of composites and the advantages of designing with composites are discussed. *Preq:* EM 304.

450, 650 Mechanical Vibrations 3(3,0) Mathematical analysis of physical problems in the vibration of mechanical systems. Topics include linear-free vibrations, forced vibrations, and damping in single degree of freedom systems, transient vibrations, critical speeds and whirling of rotating shafts, dynamic balancing, and multidegree of freedom systems with lumped parameters. *Preq:* EM 202, 304, MTHSC 208.

470, 670 Experimental Stress Analysis 3(2,3) Experimental analysis of static and dynamic stress fields. Emphasis is on the techniques required to obtain data and the theoretical analysis required for proper interpretation. Methods and instrumentation associated with strain gages (including transducer applications), Moire grids, brittle coatings, photoelasticity, and photoelastic coatings are studied. *Preq:* EM 304 and consent of instructor.

829 Energy Methods and Variational Principles 3(3,0)

831 Theory of Elasticity I 3(3,0)

832 Theory of Elasticity II 3(3,0)

834 Principles of Structural Stability 3(3,0)

845 Intermediate Dynamics 3(3,0)

852 (CE) Advanced Finite Element Analysis 3(3,0)

860 Mechanics of Plasticity 3(3,0)

891 Master's Research. Credit to be arranged.

893 Selected Topics in Engineering Mechanics 1-6(1-6,0)

901 Foundations of Nonlinear Shell Theory 3(3,0)

991 Doctoral Research. Credit to be arranged.

ENGLISH (ENGL)

Professors: H. B. Bryant, R. J. Calhoun, F. L. Day, D. G. Goswami, J. L. Idol, Jr., G. W. Koon, *Head:* J. J. McLaughlin, R. W. Moran, R. B. Rollin, C. H. Sawyer, F. W. Shilstone, M. S. Steadman, Jr., R. A. Underwood, M. R. Winchell, A. P. Young; *Associate Professors:* R. E. Barfield, Jr., D. G. Bzdyl, S. K. Eisiminger, L. L. Henry, C. E. Johnston, C. R. Lovitt, V. A. Rudowski, T.

W. Russell III, D. C. Tillinghast, M. O. Usrey, E. P. Willey, C. H. Woodell; *Assistant Professors*: S. D. Boerckel, M. J. Charney, D. N. Griffin, S. J. Hilligoss, M. J. Jacobi, J. B. Simms, E. K. Sparks, J. P. Stanton, E. V. Truesdale, Jr., C. M. Ward, D. B. Winchell, J. P. Zanes; *Instructors*: C. V. Barnes, B. Brannon, A. E. Childress, E. F. Dendy, L. H. Dunlap, C. E. Foster, A. J. Haubenreich, C. L. Holt, L. L. Langford, A. A. Metzegen-Bundi, T. E. Rash, R. G. Schnelle, R. C. Standridge, J. H. Tibbetts, S. F. Titus, D. G. Tool, J. M. Turlington, M. L. Walker, M. P. White, M. R. Wininger; *Visiting Instructors*: C. D. Albergotti III, L. M. Christoph, L. C. Collins, J. Crowe, M. D. O'Dell, V. D. White III, D. T. Yarrow; *Lecturer*: B. J. Ramirez

100 English Fundamentals 3(3,0) Drill in basic writing skills: mechanics, spelling, syntax, usage, dialect, sentence clusters, and paragraphing. Required of all freshmen who do not make a satisfactory score on the SAT verbal. Carries no credit for graduation.

101, H101 Composition I 3(3,0) Training in correct and effective expression, in brief expository essays; review of the fundamentals of grammar and punctuation; instruction in common expository methods.

102, H102 Composition II 3(3,0) Continued emphasis on correct and effective expression; training in the organization and writing of the research report. *Preq*: ENGL 101.

111 English As a Second Language 3(3,2) A special course for students learning English as a second language. Intensive study and drill in American English pronunciation and listening comprehension. Required of all foreign students who do not make a satisfactory grade on screening examinations in oral English. To be taken pass/fail only. Carries no credit for graduation.

190 The Study of English 1(1,0) Orientation to the study of English language and literature and to the sources and methods of literary research. Required of all English majors and recommended for minors.

202 The Major Forms of Literature 3(3,0) Study of the basic structures and elements of fiction, poetry, and drama, including literary and critical theory, with readings in American, British, and world literature. Proficiency in composition must be demonstrated. *Preq*: ENGL 102.

203, H203 Survey of English Literature I 3(3,0) Chief British authors and works from *Beowulf* to the Romantic period. Proficiency in composition must be demonstrated. *Preq*: ENGL 102.

204, H204 Survey of English Literature II 3(3,0) Chief British authors and works from the Romantic period to 1945. Proficiency in composition must be demonstrated. *Preq*: ENGL 102.

205, H205 Survey of American Literature I 3(3,0) American Literature to the Civil War, with emphasis on major writers. Proficiency in composition must be demonstrated. *Preq*: ENGL 102.

206, H206 Survey of American Literature II 3(3,0) American Literature from the Civil War to 1945, with emphasis on major writers. Proficiency in composition must be demonstrated. *Preq*: ENGL 102.

207 Survey of World Literature I 3(3,0) Translations of continental European literature from Homer to the Renaissance (together with some Asian classics), with emphasis on major authors. Proficiency in composition must be demonstrated. *Preq*: ENGL 102.

208 Survey of World Literature II 3(3,0) Translations of continental European literature from the seventeenth century to the present (together with some Asian classics), with emphasis on major writers. Proficiency in composition must be demonstrated. *Preq*: ENGL 102.

209 Contemporary Literature 3(3,0) A study of selected writers since 1945, primarily British and American. Proficiency in composition must be demonstrated. *Preq*: ENGL 102.

217 Vocabulary Building 3(3,0) Development of a useful discriminating vocabulary for writing, speaking, and reading. Student notebooks and proficiency quizzes. *Preq*: ENGL 102.

231 Introduction to Journalism 3(3,0) Instruction and practice in writing for mass media; editorial responsibilities. *Preq*: ENGL 102.

300 Introduction to Linguistics 3(3,0) Introduction to general linguistic principles. A survey of the biological, structural, and social aspects of language. *Preq*: Sophomore literature.

304 Business Writing 3(3,0) An introduction to business writing: memoranda, letters, reports, and research methods. *Preq*: Junior standing.

312 Advanced Expository Writing 3(3,0) A workshop in practical writing focusing on principles and style. *Preq*: Sophomore literature or consent of instructor.

- 314 Technical Writing 3(3,0)** Intensive training in the fundamentals of technical writing: reports, letters, and memoranda. *Preq:* Junior standing.
- 316 Writing and International Trade 3(3,0)** Students will complete projects demanding a variety of communications skills that professionals in International Trade need; sensitivity to foreign audiences and cultures in oral and written communication, electronic and graphic communication, collaborative writing and management. *Preq:* Sophomore literature.
- 331 Publications Workshop 1(1,0)** Workshop designed for students who serve on student publication staffs. This course emphasizes the responsibilities of staff members. May be repeated for a maximum of three credits. *Preq:* ENGL 102 and consent of the instructor.
- 333 Reporting for the News Media 3(3,0)** Practical experience in gathering and writing news and feature copy for the media, concentration on print journalism; examination of the role of the modern journalist; laws governing the profession, journalistic ethics. *Preq:* ENGL 231 or consent of instructor.
- 334 Feature Writing 3(3,0)** Practical experience in writing feature articles for newspapers, magazines, and free-lance markets. *Preq:* ENGL 231 or consent of instructor.
- 335 Editing for Newspapers 3(3,0)** Examination of the editing process of newspapers and magazines. Practical experience in article selection, copy-editing, headline writing, and page design. *Preq:* ENGL 231 or consent of instructor.
- 345 The Structure of Fiction 3(3,0)** Introduction to the creative writing and critical study of prose fiction. *Preq:* Sophomore literature or consent of instructor.
- 346 The Structure of Poetry 3(3,0)** An introduction to the creative writing and critical study of poetry. *Preq:* Sophomore literature or consent of instructor.
- 347 The Structure of Drama 3(3,0)** Introduction to the creative writing and critical study of drama. *Preq:* Sophomore literature or consent of instructor.
- 350 Mythology 3(3,0)** A study of the great myths of the world with an emphasis on their applications to literature. *Preq:* Sophomore literature or consent of instructor.
- 351 American Folklore 3(3,0)** Study of American folklore with an emphasis on such considerations as the folktale, folk songs and ballads, folk heroes, and folk superstitions and remedies. *Preq:* Sophomore literature or consent of instructor.
- 353 Ethnic American Literature 3(3,0)** A critical examination of essays, poetry, fiction, and drama written by members of a variety of American racial and ethnic groups, such as Native Americans, Afro-Americans, Chicano-Mexicans, Asian Americans, Italian Americans, and American Jews. *Preq:* Sophomore literature or consent of instructor.
- 355 Popular Culture 3(3,0)** An examination of the nature, functions, history, and impact upon American society of best sellers, popular magazines, television, movies, and other like phenomena. *Preq:* Sophomore literature or consent of instructor.
- 356 Science Fiction 3(3,0)** Readings in science fiction from the seventeenth century to the present, with special emphasis on writers since Verne and Wells. *Preq:* Sophomore literature or consent of instructor.
- 357 Film 3(3,0)** An examination of the film medium as an art form: its history, how films are made, why certain types of films (western, horror movies, and so forth) have become popular, and how critical theories provide standards for judging film. *Preq:* Sophomore literature or consent of instructor.
- 358 Advanced Studies in Film 3(2,3)** Continued study of film theory and aesthetics, with applications of that knowledge to the making of a film. *Preq:* ENGL 357 or consent of instructor.
- 359 Special Topics in Language, Literature, or Culture 3(3,0)** Studies in varied topics not central to other English courses, such as Literature and Art/Business/Sports; Language and Style; Black Literature. Specific titles and course descriptions to be announced from semester to semester. May be repeated once with department head's consent. *Preq:* Sophomore literature or consent of instructor.

380 British and American Women Writers 3(3,0) Poetry, drama, fiction, and prose by established and little-known women writers in Britain and America. Particular attention to works treating themes and issues concerning women's lives. Readings on such topics as women and work, education, religion, creativity. *Preq:* Sophomore literature or consent of instructor.

385 Children's Literature 3(3,0) Wide reading in prose and verse suitable for children in elementary grades. *Preq:* Sophomore literature.

386 Adolescent Literature 3(3,0) Wide reading in prose and verse suitable for children in secondary schools. *Preq:* Sophomore literature.

392 Technical Editing 3(3,0) Practical experience in editing and preparing technical manuscripts for publication. General introduction to the functions of the technical editor. *Preq:* ENGL 304, 314, or consent of instructor.

400, 600 The English Language 3(3,0) Studies in English usage and the historical development of the language. *Preq:* Sophomore literature.

401, 601 Grammar Survey 3(3,0) Survey of modern grammars with a focus on exploring the impact structural grammar has had on traditional grammar. Recommended for English teachers. *Preq:* Sophomore literature.

402, 602 Syntax 3(3,0) Introduction to transformational grammar with a focus on syntax. *Preq:* ENGL 300 or consent of instructor.

403, 603 The Classics in Translation 3(3,0) An examination of Homer's *Iliad* and *Odyssey*, Virgil's *Aeneid*, and Ovid's *Metamorphoses*. A few shorter works by other Greek and Roman writers may also be read. *Preq:* Sophomore literature.

404, 604 Classical Drama 3(3,0) Selected reading in the dramatic literature of classical Greece and Rome. *Preq:* Sophomore literature.

405, 605 Studies in English Literature to 1700 3(3,0) Selected readings in English literature from the beginnings to 1700, with emphasis on social and intellectual backgrounds. *Preq:* Sophomore literature.

406, 606 Studies in English Literature Since 1700 3(3,0) Selected readings in English literature from 1700 to the present, with emphasis on social and intellectual backgrounds. *Preq:* Sophomore literature.

407, 607 The Medieval Period 3(3,0) Selected works of Old and Middle English literature, exclusive of Chaucer. *Preq:* Sophomore literature.

408, 608 Chaucer 3(3,0) Selected readings in Middle English from *The Canterbury Tales* and other works by Chaucer. *Preq:* Sophomore literature.

409, 609 The Earlier English Renaissance 3(3,0) Tudor and Elizabethan poetry, prose, fiction, translations, essays, and criticism. *Preq:* Sophomore literature.

410, 610 Drama of English Renaissance 3(3,0) Selected readings in non-Shakespearean dramatic literature of the 16th and 17th centuries. *Preq:* Sophomore literature.

411, 611 Shakespeare 3(3,0) A study of selected tragedies, comedies, and history plays of Shakespeare. Required of all English majors. *Preq:* Sophomore literature.

412, 612 Studies in Shakespeare 3(3,0) Special topics in Shakespeare as selected by instructors. May be repeated once with department head's consent. *Preq:* Sophomore literature.

413, 613 Later English Renaissance 3(3,0) Nondramatic poetry and prose from Ben Jonson, John Donne, and Francis Bacon through Andrew Marvell and John Bunyan, excluding Shakespeare and Milton. *Preq:* Sophomore literature.

414, 614 Milton 3(3,0) The development of Milton's art and thought from the minor poems and selected prose through *Paradise Lost*, *Paradise Regained*, and *Samson Agonistes*, set against the background of the late Renaissance. *Preq:* Sophomore literature.

415, 615 The Restoration and Eighteenth Century 3(3,0) Readings in Dryden, Swift, Pope and Dr. Johnson. *Preq:* Sophomore literature.

416, 616 The Romantic Period 3(3,0) Readings from the poetry and critical prose of Blake, Wordsworth, Coleridge, Byron, Shelley, Keats, and other representative figures. *Preq:* Sophomore literature.

- 417, 617 The Victorian Period 3(3,0)** Reading from the poetry and nonfiction prose of selected Victorian authors, including works of Carlyle, Tennyson, Browning, Arnold, and other representative figures. *Preq:* Sophomore literature.
- 418, 618 The English Novel 3(3,0)** Study of the English novel from its 18th century beginnings through the Victorian Period. *Preq:* Sophomore literature.
- 422, 622 American Literature I 3(3,0)** Major American authors and movements from the Colonial period to the Civil War. *Preq:* Sophomore literature.
- 423, 623 American Literature II 3(3,0)** Major American authors and movements from the Civil War to the early 20th century. *Preq:* Sophomore literature.
- 424, 624 American Literature III 3(3,0)** Major American authors and movements of the 20th century. *Preq:* Sophomore literature.
- 425, 625 The American Novel 3(3,0)** A survey of the most significant forms and themes of the American novel from its beginnings to 1900. *Preq:* Sophomore literature.
- 426, 626 Southern Literature 3(3,0)** The intellectual and literary achievement of the South from 1607 to the present, with emphasis upon the writers of the 19th century. *Preq:* Sophomore literature.
- 430, 630 Modern Drama 3(3,0)** Principles and progress of drama from Ibsen to the present; analysis of representative plays; critical reports; discussion of trends in contemporary drama. *Preq:* Sophomore literature.
- 431, 631 Modern Poetry 3(3,0)** The modern tradition in English and American poetry from Yeats to the present; relevant critical essays. *Preq:* Sophomore literature.
- 432, 632 Modern Fiction 3(3,0)** American and British novels and short stories of the 20th century. *Preq:* Sophomore literature.
- 435, 635 Literary Criticism 3(3,0)** Major critical approaches to literature. *Preq:* Sophomore literature.
- 436, 636 Feminist Literary Criticism 3(3,0)** Introduction to the germinal works of feminist literary theory and criticism. Outlines the development of modern literary criticism by studying feminist versions of the major critical methodologies. *Preq:* Sophomore literature or consent of instructor.
- 437, 637 Directed Studies 1-3(1-3,0)** Class and tutorial work for students with special interests or projects in American, British, or European literature outside the scope of existing courses. Application(s) must be approved during the preregistration period of the semester preceding the one in which directed studies will occur. May be repeated by arrangement with the department. *Preq:* Junior standing and approved preregistration.
- H438 Senior Division Honors Research 3(3,0)** Research for the preparation of an honors project. *Preq:* Senior standing, and approval of the Department of English and the University Honors Program Committee.
- H439 Senior Division Honors Project 3(3,0)** Preparation of an honors project. *Preq:* ENGL H438 and senior standing.
- 445, 645 Fiction Workshop 3(3,0)** A workshop in the creative writing of prose fiction. May be repeated one time for credit. *Preq:* ENGL 345 or consent of instructor.
- 446, 646 Poetry Workshop 3(3,0)** A workshop in the creative writing of poetry. May be repeated one time for credit. *Preq:* ENGL 346 or consent of instructor.
- 447, 647 Playwriting Workshop 3(0,3)** A workshop in the creative writing of plays. May be repeated one time for credit. *Preq:* ENGL 347 or consent of instructor.
- 455, 655 American Humor 3(3,0)** Native American humor of the 19th and 20th centuries. *Preq:* Sophomore literature.
- 459 Advanced Special Topics in Language, Literature, or Culture 3(3,0)** Advanced studies in topics not central to other English courses, such as certain authors, works, genres, themes, or areas of knowledge and culture. Specific topics will be announced when offered. May be repeated once for credit with department head's consent. *Preq:* Sophomore literature.

485, 685 Composition for Teachers 3(3,0) Practical training in teaching composition: finding workable topics, organizing and developing observations and ideas, evaluating themes, and creative writing. *Preq:* Sophomore literature.

490, 690 Advanced Technical and Business Writing 3(3,0) Advanced work in writing proposals, manuals, reports, and publishable articles. Students will produce work individually and in groups. *Preq:* ENGL 304 or 314 or consent of instructor.

491, 691 Classical Rhetoric 3(3,0) Study of the major texts in classical rhetoric. This course examines the nature and functions of rhetoric in Greek and Roman societies. It traces the development of rhetoric from Protagoras through Isocrates, Plato, Aristotle, Cicero, and Quintillian, and considers questions essential to understanding persuasive theory and practices. *Preq:* Sophomore literature or consent of instructor.

492, 692 Modern Rhetoric 3(3,0) Examines the "new rhetorics" of the 20th century, which are grounded in classical rhetoric but which include findings from biology, psychology, linguistics, and anthropology, among other disciplines. It considers the theories and applications of communication. *Preq:* Sophomore literature or consent of instructor.

700 Children's Literature for Teachers 3(3,0)

701 Literature for Teachers 3(3,0)

800 Introduction to Research 1(1,0)

801 Topics in Composition and Rhetoric 3(3,0)

802 Topics in Literary Genres 3(3,0)

805 Topics in Medieval Literature 3(3,0)

808 Topics in Renaissance and Restoration Literature 3(3,0)

811 Topics in Neoclassical and Romantic Literature 3(3,0)

814 Topics in Victorian and Modern British Literature 3(3,0)

820 Topics in American Literature to 1865 3(3,0)

823 Topics in American Literature Since 1865 3(3,0)

831 Special Topics 3(3,0)

832 Topics in Scientific, Technical, and Business Writing 3(3,0)

835 Topics in Literary Criticism 3(3,0)

837 Topics in Linguistics 3(3,0)

840 Directed Studies 3(3,0)

891 Master's Research. Credit to be arranged.

ENTOMOLOGY (ENT)

Professors: D. R. Alverson, T. M. Brown, G. R. Carner, S. B. Hays, *Head*; J. C. Morse, R. Noblet, T. E. Skelton; *Associate Professors:* J. D. Culin, P. A. Zungoli; *Assistant Professor:* P. H. Adler

200 Insects 2(2,0) Introduction to insects; their various relationships with man, other animals and plants. The general nature of this course makes it beneficial to all students regardless of specialty. Closed to students who have had ENT 301 or equivalent.

301 General Entomology 3(2,3) A general introduction to entomology with emphasis on anatomy, metamorphosis, and description of the most common insect species. Methods of control are introduced and current control practices are explained for some of the more important species.

308 Apiculture 3(2,3) A detailed study of the honey bee and its economic importance in pollination and honey production. Attention will be given to bee behavior, colony management, equipment, honey plant identification, and honey production and processing. *Preq:* BIOL 104, 106, and consent of instructor.

355 Veterinary Entomology 3(2,3) Study of the biology, identification, damage and management of arthropod pests of veterinary importance and their role in transmission of diseases in animals, principally domestic livestock and poultry. Students will learn both the theoretical and practical aspects of integrated management of arthropod pests of livestock and poultry. *Preq:* Junior standing.

401, H401, 601 Insect Pests of Ornamental Plants and Shade Trees 3(2,3) Recognition, biology, damage and control of insect pests of woody and other ornamental plants and shade trees. *Preq:* ENT 301.

402, H402, 602 Fruit, Nut, and Vegetable Insects 3(2,3) Common insect pests of the following are studied: peaches, apples, grapes, pecans, sweet corn, cole crops, cucurbits, potatoes, sweet potatoes, peas, and beans. Primary emphasis is placed on life histories, identification of destructive forms, recognition of damage, and current control measures. *Preq:* ENT 301.

403, H403, 603 Field Crop Entomology 3(2,3) Recognition, life histories, damage and control of economically important insect pests of major field crops, with an introduction to principles and practices of crop protection, including pesticide application, economic basis for making treatment decisions, and development of scouting programs. *Preq:* ENT 301.

404, H404, 604 Urban Entomology 3(2,3) Study of pests common to the urban environment with emphasis on biology, damage, control, and identification of household, structural, stored products, and food pests. Students will learn both theoretical and practical aspects of urban pest management and the pest-control industry. *Preq:* ENT 301.

405, H405, 605 Insect Morphology 4(3,3) A study of insect structure in relation to function and of the variation of form in insects. *Preq:* ENT 301.

410, 610 Insect Taxonomy 3(1,6) The identification of the principal families of the major orders of adult insects. Laboratory work consists of intensive practice of such identification; lecture material deals with necessary theoretical discussion of taxonomic features observed in the laboratory. *Preq:* ENT 405 or consent of instructor.

412, 612 Field and Museum Entomology 3(0,9) Practical aspects of gathering, sorting, and curating insects. Students participate in intensive overnight insect-collecting expeditions to various parts of the Southeastern United States, becoming acquainted with insect habitats and collecting methods. The remainder of the summer session will be devoted to training in specimen preparation and preservation. *Preq:* Consent of instructor.

420, 620 Toxicology of Insecticides 3(2,3) Concepts of insecticide toxicology; principles of insecticide action; toxicological and pharmacological effects in insects and higher animals, safety, current regulations governing the use of insecticides. *Preq:* ENT 301.

430, 630 Toxicology 3(3,0) Basic principles of toxicology including quantitation of toxicity, toxicokinetics, biochemical action of poisons, and environmental toxicology are studied. Acute and chronic effects of various classes of poisons (e.g., pesticides, drugs, metals, and industrial pollutants) are discussed in relation to typical routes of exposure and regulatory testing methods. *Preq:* Organic chemistry, one year of general biology, or consent of instructor.

440, 640 Insect Behavior 3(2,3) Fundamentals of insect behavior in an evolutionary and ecological perspective. Laboratories emphasize generation and testing of hypotheses and observation, description, and quantification of insect behavior. *Preq:* ENT 301 or consent of instructor.

455, H455, 655 Medical and Veterinary Entomology 3(2,3) Insects and their arthropod relatives which are of economic importance in their effect on man and animals. *Preq:* ENT 301 or consent of instructor.

461 Directed Research in Entomology 1-3(0,3-9) Research problems in selected entomological areas to provide the student with experience in planning and conducting research and presentation of research results. May be repeated for a maximum of three credits. *Preq:* Consent of instructor.

462 Seminar 1(1,0) Literary search and oral presentation of current entomological topics.

468, 668 Research Techniques 2(2,0) Conceptual and practical development of research projects in certain fields of biological and agriculture research. Experiment, and presentation of results in written and oral formats. Library and computer usage is strongly emphasized.

469, H469, 669 (WFB) Aquatic Insects 3(1,6) Identification, life history, habitats, and interrelationships of aquatic insects; techniques of qualitative field collecting; important literature and research workers. *Preq:* ENT 301 or consent of instructor.

470, H470, 670 Insect Physiology 3(2,3) An introduction to the physiological systems of insects including structure as related to function. Emphasis will be on digestion, nutrition, reproduction, respiration, excretion, and nervous and hormonal systems as they affect growth and development in insects. *Preq:* ENT 301 or consent of instructor.

480, H480, 680 Insect Pathology 3(2,3) Study of insect diseases including those caused by viruses, rickettsiae, bacteria, fungi, protozoa, and nematodes will be covered in this course. The effects of diseases on insect populations and the use of pathogens in insect control will also be considered in detail. *Preq:* ENT 301 or consent of instructor.

490 Practicum 1-4 Supervised entomological learning opportunity, providing highly individualized experiences to complement other programs and courses. Must be prearranged at least two months in advance. Must file written report midway during enrollment period and at its conclusion. Must appear for oral evaluation at the end of the period. *Preq:* Junior standing and consent of instructor.

808 Taxonomy of Immature Insects 3(1,6)

809 Seminar in Entomology 1(1,0)

810 Special Topics in Entomology 1-4(1-4,0)

812 Entomological History and Literature 1(1,0)

840 Insect Ecology 3(2,3)

853 Applied Systematics 3(2,3)

856 Medical Entomology 3(2,3)

860 Insect Pest Management 3(3,0)

861 Insect Toxicology 3(2,3)

863 Special Problems in Entomology 1-3(0,3-9)

870 Advanced Insect Physiology 3(2,3)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

ENVIRONMENTAL SCIENCE (ENSC)

Professors: A. R. Abernathy, A. W. Elzerman, R. O. Hegg, T. M. Keinath

200 Introduction to Environmental Science 3(3,0) Basic principles of environmental science including ecology, energy, resources, waste management, and air, water, and soil pollution. Consideration of issues, specific cases, investigative approaches and remedial actions. *Preq:* Sophomore standing and either two semesters of freshman chemistry or biology.

400 Studies in Environmental Science 3(3,0) Study of historical perspectives, attitudes, and government policy within the framework of environmental case studies to illustrate the interaction between human and natural factors as they mutually affect the environment and man's ability to deal with that environment. *Preq:* ENSC 200 or consent of instructor.

431, 631 Public Health Administration 3(3,0) A course designed to prepare one for a career in the environmental sciences, with positions in public health and pollution control. Topics included are public health organizations and regulations, public relations, psychology of public health administration, and the use of the communications media in educating the public on health problems.

432 Inspection Methods in Water and Solid Waste 3(2,3) Methods of disposal of liquid and solid wastes will be emphasized in regard to environmental quality control. Treatment plant methods will be discussed. Inspection techniques for adequate treatment is a basic approach.

471, 671 Man and His Environment 2(2,0) The interaction of man with his environment will be surveyed. Factors such as urbanization, population growth, pathogens, disease vectors, ionizing radiation, sewage disposal, and noise control will be considered. The effects of environmental contacts with air, water, food, and solid and liquid wastes will be emphasized. *Preq:* Consent of instructor.

472, 672 Environmental Planning and Control 2(2,0) Application of planning and control to effective environmental quality improvement. Water supply and treatment, wastewater treatment and disposal, solid waste disposal, air pollution abatement, and land use and zoning will be considered from the standpoint of control. Not intended for graduate students in engineering. *Preq:* Consent of instructor.

ENVIRONMENTAL SYSTEMS ENGINEERING (ESE)

Professors: A. R. Abernathy, B. C. Dysart III, A. W. Elzerman, C. P. Grady, Jr., J. C. Jennett, T. M. Keinath, *Head:* T. J. Overcamp, R. K. White; *Associate Professor:* R. A. Fjeld; *Assistant Professor:* K. J. Farley; *Adjunct Professors:* A. W. Garrison, C. M. King; *Adjunct Associate Professor:* G. M. Mills; *Visiting Professor:* L. G. Rich

401, 601 Environmental Engineering 3(3,0) An introduction to the field of environmental engineering. Topics include environmental phenomena, impact of pollutants in the aquatic environment, solid-waste management, air pollution control, radiological health, and simple water and wastewater treatment systems. *Preq:* Junior standing in engineering or consent of instructor.

402, 602 Water and Waste-Treatment Systems 3(3,0) A study of the fundamental principles, rational design considerations, and operational procedures of the unit operations and processes employed in water and waste treatment. Both physiochemical and biological treatment techniques will be discussed. An introduction to the integration of unit operations and processes into water and waste treatment systems. *Preq:* EM 320 or consent of instructor.

408, 608 (AGRON) Land Treatment of Wastewater and Sludges 3(3,0) See AGRON 408.

410, 610 Environmental Radiation Protection I 3(3,0) Fundamental principles of radiological health and radiation safety. Topics include radiation fundamentals, basic concepts of environmental radiation protection, internal and external dosimetry, environmental-dose calculations and radiation protection standards. *Preq:* Consent of instructor.

411, 611 Ionizing Radiation Detection and Measurement 2(1,3) Laboratory exercises in ionizing radiation measurements. Topics include nuclear electronics; counting statistics; radiation interactions; basic gas, scintillation, and semiconductor detectors; gamma spectrometry; health physics survey instrumentation; and thermoluminescent dosimetry. *Preq:* Consent of instructor.

430, 630 Air Pollution Engineering 3(3,0) Introductory course in air pollution and its control. Topics include air pollutants and effects, sources, dispersion models, engineering controls, and air quality legislation. *Preq:* Senior standing in engineering or physical sciences.

451, H451, 651 (AGE, FOR) Newman Seminar in Engineering 1(0,2) See AGE 451.

470, 670 Water Resources Engineering 3(3,0) Covers range of water resources development with emphasis on engineering aspects of traditionally important purposes of flood control, navigation, hydroelectric power, and reclamation. Stresses comprehensive, multiple purpose, and systems aspects of modern water resources development and management. Includes introduction to use of mathematical modeling and digital simulation in water resources planning and project design.

482, 682 (CE) Groundwater and Contaminant Transport 3(3,0) Basic principles of groundwater hydrology and transport of contaminants in groundwater systems; groundwater system characteristics; steady and transient flow; well hydraulics, design, and testing; contaminant sources, movement and transformations. *Preq:* EM 320. *Coreq:* ESE 401.

485, 685 Hazardous Waste Management 3(3,0) Introduction to the problems, regulations, treatment, and ultimate disposal of hazardous and toxic materials. Spill cleanup, groundwater transport, land disposal, incineration and treatment technologies are discussed. *Preq:* Senior standing in engineering or sciences.

491 Selected Topics in Environmental Engineering 1-3 A study of the dynamic role of environmental engineering in maintaining environmental quality. A comprehensive study of any phase of environmental engineering. *Preq:* Consent of department head.

701 Special Problems 1-6(1-6,0)

802 Environmental Engineering Principles 3(3,0)

803 Physicochemical Operations in Water and Wastewater Treatment Systems 4(4,0)

804 Biochemical Operations in Wastewater Treatment Systems 3(3,0)

805 Laboratory in Water and Wastewater Treatment Operations 2(0,6)

806 Integrated Design of Water and Wastewater Treatment Systems 4(4,0)

809 Industrial Wastewater Treatment 3(3,0)

812 Environmental Nuclear Engineering 3(3,0)

813 Environmental Radiation Protection Laboratory II 1(0,3)

- 831 Air Quality Monitoring 3(2,3)
- 832 Air Pollution Meteorology 3(3,0)
- 833 Air Pollution Control Systems 3(3,0)
- 843 Environmental Engineering Chemistry 3(3,0)
- 844 Environmental Engineering Chemistry Laboratory 2(1,3)
- 847 Advanced Topics in Environmental Engineering Chemistry 3(3,0)
- 849 Environmental Engineering Chemistry Laboratory 2(0,6)
- 850 Stream and Estuarine Analysis 3(3,0)
- 851 Biological Principles of Environmental Engineering 3(3,0)
- 852 Ecological Models 3(2,3)
- 856 Pollution of the Aquatic Environment 3(3,0)
- 857 Pollution of the Aquatic Environment Laboratory 1(0,3)
- 861 Environmental Systems Engineering Seminar 0-1(1,0)
- 862 Environmental Quality Case Study 1(0,3)
- 875 Water Resources Planning 3(3,0)
- 876 Water Resources Systems 3(3,0)
- 880 Environmental Risk Assessment 3(3,0)
- 881 Special Problems 1-4
- 883 Selected Topics in Environmental Engineering 1-4
- 884 Selected Topics in Environmental Engineering 1-4
- 891 Master's Research. Credit to be arranged.
- 991 Doctoral Research. Credit to be arranged.

EXPERIMENTAL STATISTICS (EXST)

Professors: P. M. Burrows, W. P. Byrd, L. W. Grimes, H. S. Hill, Jr.; *Associate Professor:* W. C. Bridges, Jr.; *Instructor:* J. E. Toler

301 Introductory Statistics 3(2,2)F, S Basic concepts and methods of statistical inference; organization and presentation of data, elementary probability, measures of central tendency and variation, tests of significance, sampling, simple linear regression and correlation. The role of statistics in interpreting research, and the general application of the methods are stressed.

411, 611 Statistical Methods for Process Development and Control 3(3,0)S Experimental design techniques for use in process development, application of screening experiments and response surface experiments, techniques for process control with implications for product quality control. Includes discussions of the use of statistical computer analyses and interpretations including computer generated graphics. *Preq:* MTHSC 206 or consent of instructor.

462, 662 Statistics Applied to Economics 3(3,0)F Continuation of EXST 301 with emphasis on statistical methods used in the collection, analysis, presentation and interpretation of economic data. Special attention is given to time series analysis, the construction of index numbers and the designing of samples for surveys in the social science fields. *Preq:* EXST 301.

- 801 Statistical Methods 4(3,3)**
- 803 Regression and Least Squares Analysis 3(3,0)**
- 804 Sampling 3(3,0)**
- 805 Design and Analysis of Experiments 3(3,0)**
- 811 Special Problems in Experimental Statistics 1-3(0,2-6)**
- 812 Special Topics in Experimental Statistics 1-3(1-3,0)**

FINANCE (FIN)

Professor: R. H. Mabry, *Head*; *Associate Professors:* E. J. Ferreira, J. M. Harris, Jr., W. A. Kelly, Jr., R. H. Klein, R. B. McElreath, Jr., J. H. Mulherin III; *Assistant Professors:* S. W. Barnhart, M. L. Mitchell, M. F. Spivey, T. M. Springer, N. G. Waller; *Visiting Instructor:* J. R. Rouse

101 (ACCT) Accounting and Finance Orientation 1(1,0) See ACCT 101.

210 Introduction to Investments 3(3,0) Examination of the basics of various investment alternatives. Course is aimed toward the nonbusiness major. Credit may not be received for both FIN 210 and 305.

304 (ECON) Risk and Insurance 3(3,0) Studies the nature of risk and the role of insurance in risk management from individual and business viewpoints. Topics include probability, theory of the firm under uncertainty, insurance carriers and contracts, underwriting, and regulation. *Preq:* ECON 200, 211, or consent of instructor.

305 (ECON) Investment Analysis 3(3,0) A study of techniques useful in analyzing alternative investment opportunities with emphasis on corporate securities. Investment planning and portfolio management are considered. *Preq:* FIN 306 or 311 or consent of instructor.

306 Corporation Finance 3(3,0) Introduction to financial management of nonfinancial firms. Includes such topics as analysis of financial statements, financial forecasting, capital budgeting, working capital management, and long-term financing decisions. Credit may not be received for both FIN 306 and 311. *Preq:* ACCT 200 or 202 or 203, or consent of instructor.

307 Principles of Real Estate 3(3,0) A course to acquaint the student with the theories, practices, and principles which govern real estate markets. Major emphasis will be placed on three areas: (1) specifics of real estate brokerage, property rights and ownership; (2) making real estate investment decisions; and (3) financing real estate investments. *Preq:* FIN 306, or 311 or consent of instructor.

308 Financial Institutions and Markets 3(3,0) A study of financial institutions and markets with emphasis upon the role of financing American industry. *Preq:* ECON 302, FIN 306 or 311.

311, H311 Financial Management I 3(3,0) First of a two-course sequence designed to provide in-depth exposure to the theory and practice of corporate financial management and to demonstrate how financial management techniques are applied in decision-making. Credit cannot be received for both FIN 306 and 311. *Preq:* ACCT 202 and MTHSC 203 or 301.

312, H312 Financial Management II 3(3,0) Continuation of the two-course sequence that begins with FIN 311. *Preq:* FIN 311 or 306 with approval of a Finance Department adviser.

402, H402, 602 Asset Management 3(3,0) A study of the decision process and analytical techniques used in evaluating corporate investment decisions, including both long-term capital investments and working capital management. Computer-based financial decision making will be used. *Preq:* FIN 312 or consent of instructor.

404 Management of the Corporate Capital Structure 3(3,0) Financial policy, theory, and cases dealing with the use of debt financing, dividend policy, convertible securities, mergers and acquisitions, leasing, and special topics. *Preq:* FIN 312 or consent of instructor.

405, 605 Portfolio Management and Theory 3(3,0) Introduction to portfolio management. Includes the underlying theory, managing the equity and the fixed-income portfolios, portfolio evaluation, options-pricing theory, future markets and instruments. *Preq:* FIN 305 and either 306 or 311; or consent of instructor.

406, 606 Stock Options and Futures Markets 3(3,0) Consideration of the option pricing theory and strategy techniques most commonly used in the market for options. An overview of the futures markets is also considered. Special emphasis given to interest-rate futures, stock-index futures, and foreign-exchange futures. *Preq:* FIN (ECON) 305 or consent of instructor.

407, 607 Real Estate Investment and Finance 3(3,0) Emphasizes the fundamentals and techniques of economic and financial analysis in real estate investing. Also emphasizes the principles of mortgage credit and current financing methods in real estate transactions. *Preq:* FIN 307.

408 Management of Financial Institutions 3(3,0) Detailed study of the operational, marketing, and regulatory aspects of the management of depository financial institutions. Emphasis will be placed on decision making through the extensive use of cases. *Preq:* FIN 308.

410, H410, 610 Research in Finance 1-3 Directed research course for students interested in a career in finance. Research topic selected by student and approved by instructor. A formal research paper is required. *Preq:* FIN 306 or 312 and consent of instructor.

411 International Financial Management 3(3,0) Study of the factors that affect the company's financial management decision framework in an international environment. Special attention is given to theory and practice of managerial finance in multinational firms. *Preq:* FIN 306 or 311.

807 (CF) Financial Management 3(3,0)

811 International Financial Management 3(3,0)

830 Advanced Financial Management 3(3,0)

FOOD SCIENCE (FDSC)

Professors: J. C. Acton, C. V. Morr, W. P. Williams, Jr., *Acting Head; Associate Professors:* S. F. Barefoot, M. E. Kunkel, R. L. Thomas; *Visiting Assistant Professor:* E. C. Turner; *Adjunct Professor:* C. R. Barmore

101 Epochs in Man's Struggle for Food 1(1,0) A study of significant developments in food preservation methods and the impact each had on man's struggle for food.

201 Man and His Food 2(2,0) Study of food and food products with emphasis on nutrients, nutrient needs, and the relationship between nutrient intake and health. Also discussed are food additives, nutritional awareness (to include nutrition labeling), food protection, and the influence of processing on nutritional quality of food.

212 Man's Food Resources 2(2,0) Food material resources with reference to quality preservation, processing, and nutritional requirements. The role of science and technology in the modern food industry is emphasized. The need for food standards and grades is explained, and the functions of grading and regulatory agencies are discussed.

305, H305 Dairy and Food Engineering 3(2,3) A study of the basic engineering principles and their application to the dairy and food processing operations. The relationship between engineering principles and fundamentals of food processing is emphasized. Topics include material and energy balance, electricity, steam, refrigeration, heat transfer, fluid mechanics, evaporation, water and waste treatment.

306 Food Service Operations 3(3,0) Principles of management of resources in commercial food-service systems. Emphasis will be on types of delivery systems, principles of quantity food production, techniques for cost control and concepts of food science and food safety. *Preq:* FDSC 201 and Junior standing or consent of instructor.

401, H401, 601 Food Chemistry I 4(3,3)F Even-numbered years. The basic composition, structure, and properties of food and the chemistry of changes occurring during processing utilization. *Preq:* BIOCH 210 or consent of instructor.

402, H402, 602 Food Chemistry II 4(3,3)S Odd-numbered years. Application of theory and procedures for quantitative and qualitative analysis of food ingredients and food products. Methods for protein, moisture, lipid, carbohydrate, ash, fiber, rancidity, color and vitamin analyses and tests for functional properties of ingredients are examined. *Preq:* BIOCH 210 or consent of instructor.

403, 603 Food Preservation and Processing I 3(3,0)F Odd-numbered years. Food preservation and processing by refrigerated and frozen storage, thermal processing and pasteurization, dehydration and concentration, fermentation, radiation, microwave heating and chemical preservatives. *Preq:* Physics and organic chemistry or biochemistry.

404, 604 Food Preservation and Processing II 3(3,0)S Even-numbered years. Principles of food preservation applied to flow processes, ingredient functions, and the importance of composition and physical characteristics of foods related to their processing. Product recalls and product development concepts. *Preq:* Physics and organic chemistry or biochemistry.

405, 605 Food Preservation and Processing Laboratory I 1(0,3)F Odd-numbered years. Laboratory exercises on preservation methods, equipment utilized, and processes followed in food manufacture. *Coreq:* FDSC 403.

406, 606 Food Preservation and Processing Laboratory II 1(0,3)S Even-numbered years. Continuation of FDSC 405 with greater emphasis on processes followed in food manufacture. *Coreq:* FDSC 404.

417 Seminar 1(1,0) Literature research and oral presentation of current food science topics.

418 Seminar 1(1,0) Literature research and oral presentation of current food science topics.

420, H420 Special Topics in Food Science 1-3(1-3,0) Comprehensive study of special topics in food science not covered in detail or contained in other courses. Contemporary developments in each topic area will be stressed. Maximum of 3 credits may be taken. *Preq:* Consent of instructor.

421, H421 Special Problems in Food Science 1-4(0,3-12) Independent research investigation in food science related to processing, preservation, packaging, or nutritional aspects of foods. Special emphasis will be placed on organizing a research proposal, conducting the research, and reporting the findings. Maximum of 4 credits may be taken. *Preq:* Senior standing or consent of instructor.

422, 622 Quality Assurance and Sensory Evaluation 2(2,0)S Even-numbered years. Principles of food quality assurance programs with emphasis on the elements of sensory evaluation testing, sampling, inspections, federal and trade standards/grades, records and EVOP procedures.

424, 624 Quality Assurance and Sensory Evaluation Laboratory 1(0,3)S Even-numbered years. Continuation of FDSC 422. The mechanics of quality assurance laboratory methods with emphasis on sensory evaluation panel testing, scoring, kinesthetic properties, and grade-quality measurements.

464, 664 Food Packaging Systems 3(3,0) Characteristics and application of various materials and systems used in the packaging of foods. Engineering properties of the materials and methods used to measure such properties are emphasized. Consideration is given to packaging systems for specific food applications. *Preq:* Consent of instructor.

466, 666 Food Packaging Systems Laboratory 1(0,3) Laboratory and field exercises on food packaging operations and packaging materials. Methods to evaluate the physical and chemical properties of packaging materials will be emphasized. *Preq:* Consent of instructor.

491 Practicum 1-4 Supervised experiential opportunities in the food industry. *Preq:* Junior standing and consent of department head.

802 Food Enzymology 2(2,0)

804 Thermal Processing of Packaged Foods 3(3,0)

810 Chemical and Biochemical Aspects of Foods 4(4,0)

811 Physical and Thermo-Physical Properties of Food 3(3,0)

812 Microbiological Aspects of Food Systems 3(3,0)

820 Special Topics in Food Science 1-3(1-3,0)

821 Special Problems in Food Science 1-3(0,3-9)

851 Food Science Seminar 1(1,0)

852 Food Science Seminar 1(1,0)

891 Master's Research. Credit to be arranged.

FOOD TECHNOLOGY (FDTECH)

851 Food Technology Seminar 1(1,0)

991 Doctoral Dissertation Research 1-6(0,1-6)

FORESTRY (FOR)

Professors: R. M. Allen, B. H. Box, B. M. Cool, B. A. Dunn, D. C. Guynn, Jr., D. L. Ham, R. L. Hedden, D. N. Hon, D. D. Hook, G. D. Kessler, C. L. Lane, W. H. McGregor, G. E. Sabin, W. A. Shain, F. H. Tainter, M. A. Taras, *Head:* D. H. Van Lear, G. W. Wood, T. E. Wooten, R. Zahner; *Associate Professors:* G. R. Askew, Jr., C. A. Gresham, R. A. Harris, A. W. Lee, A. P. Marsinko, L. E. Nix, V. L. Robinson, T. M. Williams; *Assistant Professors:* J. L. Haymond, S. M. Jones, A. E. Miller, L. R. Nelson; *Instructor:* S. K. Nodine; *Lecturers:* A. T. Shearin, J. H. Syme, J. G. Williams, Jr.

101 Introduction to Forestry 1(1,0)F An informative sketch of forestry, forests, and forestry tasks of the nation; education and career opportunities for foresters.

102 Introduction to Forestry 1(1,0)S Continuation of FOR 101.

103 Society, Conservation, and Forestry 2(2,0)S Introduction to the historical, philosophical, and role of forests and forestry in society; relationship of man, forest, and conservation; major forest issues; and professional communications with the public.

205 Dendrology 3(2,3)F Classification, nomenclature, and identification of the principal forest trees of the United States, their geographical distribution, ecological requirements, and economic importance. Field identification of native trees and commonly planted exotics in the Piedmont and surrounding areas. *Preq:* BIOL 103, 105 or consent of instructor.

206 Silvics 4(3,3)S Study of the nature of forests and forest trees, how they grow, reproduce, and their relationships to the physical and biological environment. *Preq:* AGRON 202, BIOL 103 and 105, FOR 205 or consent of instructor.

209 (PRTM) Forest and Recreation Resources Application of the Microcomputer 3(2,3) See PRTM 209.

221 Wood Properties I 3(2,3)F The formation of wood in forest trees, gross and minute characteristics of wood, defects in wood, variability in wood. *Preq:* BIOL 103, 105 or consent of instructor.

222 Wood Properties II 3(2,3)S Wood in relation to moisture, heat, sound, light, and electricity; mechanical properties of wood; standard testing procedures for wood. *Preq:* FOR 221 or consent of instructor.

251 Forest Plants 1(Summer Camp) Identification of principal native forest understory plants by vegetative and floral characteristics; their site requirements and forest-type associations with emphasis on successional patterns; and their value for man and wildlife. The preparation of a field herbarium is required of all students. *Preq:* BIOL 103 and 105, FOR 205 or consent of instructor.

252 Forest Engineering 3 (Summer Camp) Field and drafting practice in mapping, traversing boundaries, and road location; use of surveying equipment and techniques. *Preq:* CE 201 or consent of instructor.

253 Forest Mensuration 4(Summer Camp) Practical application of field techniques including timber cruising, measuring tree heights and volumes, constructing volume tables and boundary line surveys. *Preq:* CE 201, FOR 205 or consent of instructor.

254 Forest Products 1(Summer Camp) A tour of the forest products industry of South Carolina with an emphasis on those products and processes of some distinction or special interest.

255 Secondary Wood Products 1(Summer Camp) A tour of the secondary wood products industries with an emphasis on industries too far from Clemson for the usual half-day field trips during regular sessions. *Preq:* FOR 205 or consent of instructor.

257 Forest Products Measurements (Summer Camp) 2 Measurements and classifications of a variety of wood products, from trees to finished products. *Preq:* FOR 221, 222 or consent of instructor.

300 Christmas Tree Production 2(2,0)F Theory and practice of establishing, managing, and marketing trees with an emphasis on Christmas tree production in the South. *Preq:* Consent of instructor.

301 Wood in Everyday Life 2(2,0)F Introduction to the properties and uses of wood. The course is general in nature and covers such topics as identifying, machining, finishing, and treating wood, furniture construction, and the techniques used in manufacturing a variety of wood products. Not open to Forest Products majors.

302, 602 Forest Mensuration 3(2,3)S A practical application of statistical and mensurational techniques in forest management. *Preq:* EXST 301, FOR 253 or consent of instructor.

304, 604 Forest Economics 3(3,0)F Economic problems and principles involved in the utilization of forest land and timber and in the distribution of forest products; cost analysis of integrated forest operations. *Preq:* ECON 200 or 211 or consent of instructor.

305 Elements of Forestry 3(2,2)F, S A compendium of forestry subjects providing a broad view of the forest environment as it relates to ecology, management and utilization of forests, especially those of South Carolina. Not open to Forest Management majors. *Preq:* BIOL 103 and 105 or consent of instructor.

- 306, 606 Wood and Wood Fiber Identification 2(1,3)F** Macroscopic and microscopic identification, properties, and uses of selected economically significant timbers. *Preq:* BIOL 103 and 105, or consent of instructor.
- 308, 608 Aerial Photographs in Forestry 3(2,3)F** An introduction to photographic measurements, aerial photo-interpretations, mapping, and timber estimating. *Preq:* CE 201, Forestry Summer Camp, or consent of instructor.
- 309 Arboriculture, Tree Care, and Maintenance 3(3,0)** Principles, practices, and problems of protecting and maintaining trees in urban and recreational areas. Examines the environmental and biological factors that affect trees in high-use areas, their management and cultural requirements, and the practices necessary for their protection and care as valuable assets in the landscape. *Preq:* Junior standing or consent of instructor.
- 310, 610 Silviculture 4(3,3)S** Theory and practice of establishing, maintaining, and harvesting forest stands in accordance with ecological and economic principles. *Preq:* FOR 206, Forestry Summer Camp, or consent of instructor.
- 311 Forest Products Marketing Practices 3(3,0)** Study of marketing practices currently employed by the forest-products industry and the application of basic marketing principles and strategic concepts in the industry's present and future marketing environment. *Preq:* Junior standing or consent of instructor.
- 312 Reproduction of Forest Trees 2(1,3)S**, Odd-numbered years. Methods of reproduction in forest trees; seed propagation, propagation by rooting and grafting techniques; environmental requirements for propagation, media, and materials. The course covers theory and practical instruction, making use of indoor and outdoor propagating beds. Limited enrollment. *Preq:* FOR 205 or consent of instructor.
- 315 Woodland Ecology 2(2,0)S** Overview of the forest emphasizing the living and nonliving components of the woodland habitat. Understanding man's use of the forest and interpreting the signs of plants, wildlife, and landscapes. Not open to Forestry majors. *Preq:* Junior standing or consent of instructor.
- 321 Drying and Machining of Wood 3(2,3)F** Wood seasoning principles and practices, seasoning defects, machinery, and preparation of wood for processing. *Preq:* FOR 221, 222 or consent of instructor.
- 322 Wood Adhesives and Finishes 2(1,3)S** Theory of adhesion, chemical bonding, rheology, chemistry of adhesion, theory of finishes, exterior coatings and paints for wood. *Preq:* CH 101, 102, FOR 221.
- 323 Deterioration and Preservation of Wood 2(2,0)S** Deterioration agents, deterioration of wood in use, control of deterioration in manufacturing, preservation processes, types of preservation, fire retardants.
- 324 Properties and Processing of Wood 3(3,0)** Study of the anatomical, chemical, and physical properties of wood and wood-processing principles and practices. Not open to Forest Products majors. *Preq:* Junior standing or consent of instructor.
- 325 Chemical Aspects of Wood Utilization 3(2,1)F** Fundamental physical, organic, and polymer chemistry is applied to chemical processing of wood. Structures, reactions, and applications of cellulose, hemicelluloses and lignin are discussed. *Preq:* CH 102 or consent of instructor.
- 403, 603 Forest Soils Seminar 1(1,0)S** Study of forest soil characteristics with respect to site evaluation, forest fertilization, planting problems, watershed management, tree-soil-microorganism interactions, and trafficability. *Preq:* Junior standing or consent of instructor.
- 405, 605 Forest Influences 2(2,0)F** Examination of the effect of forests and forestry on climate, water, soil, organisms, and humans. Reviews forest influences in relation to current environmental legislation and debate. *Preq:* FOR 206 or consent of instructor.
- 407, 607 Forest Operations 3(2,1)F** Theory and practice of conducting forestry operations. Major emphasis on the methods, analysis of associated cost, and productive rates for timber harvesting and other mechanized field operations. *Preq:* Senior standing or consent of instructor.
- 409, 609 Multiple-Use Forestry 2(2,0)S** Study of the demand placed on forests for a variety of products and uses, and how these can and must be reconciled in planning the management of each forest. *Preq:* Senior standing or consent of instructor.

411, 611 Harvesting Forest Products 3(2,3)S Application of engineering and cost analysis techniques to the evaluation of the forest transport system and various harvesting situations. *Preq:* FOR 407 or consent of instructor.

412, 612 Forest Protection 2(2,0)S Prevention and suppression of forest fires; their effect upon the environment and people; factors affecting fire behavior; and use of fire in resource management. *Preq:* Senior standing or consent of instructor.

413, 613 Integrated Forest Pest Management 4(3,3)F Nature and control of pests of forest trees and products. Will focus on the relation of pests to silviculture, management, and natural forest ecosystems. *Preq:* FOR 310 or consent of instructor.

414, 614 Forest Management Plans 2(2,0)S Analysis of factors entering into forest working plans of several forestry organizations; preparation of a preliminary management plan of a sample area. *Preq:* FOR 417.

415, 615 Forest Wildlife Management 3(2,3)F Principles, practices, and problems of wildlife management with emphasis on upland forest game species. Habitat manipulation through use of appropriate silvicultural practices in association with other techniques are evaluated. *Preq:* FOR 310 or consent of instructor.

416, 616 Forest Policy and Administration 2(2,0)S Development, principles, and legal provisions of forest policy in the United States. Administrative and executive management in forestry. *Preq:* Senior standing or consent of instructor.

417, 617 Forest Management and Regulation 3(3,0)F Correlation of production factors and yields of forests; regulation of cuts and growing stock in sustained yield management. *Preq:* Forestry Summer Camp, FOR 304 and 310.

418, 618 Forest Valuation 3(3,0)F Capital investments in forestry and the returns derivable from them; valuation of land, timber, and other resources associated with forestry; appraisal of damage and stumpage values. *Preq:* FOR 304 or consent of instructor.

419 Senior Problems 1-3(1-3,0) Problems chosen with faculty approval in selected areas of forestry. *Preq:* Senior standing.

420, 620 Forest Products 3(2,3)S Primary forest products including lumber, poles and piles, veneers and plywoods, secondary wood products; chemically derived products from wood including pulp and paper, distillation products, wood hydrolysis; miscellaneous and minor forest products. *Preq:* FOR 306, Forestry Summer Camp, or consent of instructor.

421, 621 Biology and Silviculture of Hardwood Forests 2(1,2)F Study of the silvics, growth, and development of major hardwood species of North America that will relate these biological characteristics to the ecology, silviculture, and utilization of the hardwood forests of the Eastern United States. *Preq:* FOR 205, 206, 306, 310, or consent of instructor.

422, 622 Forest Products International Trade 3(3,0) Study of major supply regions, major trade flows, international demand, trade patterns, and industry structure and practices involved in international trade of forest products. *Preq:* Senior standing or consent of instructor.

423, 623 Lectures in Forestry 2(2,0)F Lectures in various field of forestry delivered by selected representatives from forest industries, consultants, agencies, associations, and other forestry operations. To be taken on Pass/Fail basis only. *Preq:* Junior standing or consent of instructor.

424, 624 Forest Genetics and Tree Breeding 3(3,0)S, Even-numbered years. History of genetics and breeding in forestry and its relation to silviculture; natural variation, hybridization and inheritance in forest trees; tree breeding objectives and methods. *Preq:* GEN 302 or equivalent, or consent of instructor.

429, 629 Wood Design 3(2,3)F The technical mechanical properties of wood; load analysis and design criteria; design of structural elements in wood. *Preq:* FOR 328 or consent of instructor.

430, 630 Composite Wood Materials 3(2,3)F Manufacturing methods, physical and mechanical properties, and uses of wood-polymer composites, wood laminates, plywood, particleboard, fiberboard, reconstituted board products, structural sandwich panels, paper-base plastic laminates, and extruded and molded products. *Preq:* FOR 222, 328, or consent of instructor.

431, 631 Recreation Resource Planning in Forest Management 3(3,0)S, Odd-numbered years. Analysis of forest recreation as a component of multiple-use forest management; techniques of planning; physical and biological effects on forest environments; and forest site, user, and facility management.

432, 632 Forest Site Capability 2(2,0)S Analysis of use pressures on the forest land base and their effects on the capability of the forest to satisfy resource demands. Productivity and sensitivity of sites will be discussed. *Preq:* Senior standing in Forestry or consent of instructor.

434, 634 Foreign Woods and Their Properties 2(1,3)S Identification of commercially important foreign woods imported into the United States, their macroscopic and microscopic features, basic wood properties, and use. *Preq:* FOR 221, 306, consent of instructor.

435, 635 Park and Forest Structures 2(2,0)F Selection, processing, protection, and maintenance of wood used in park and forest structures. *Preq:* Senior standing or consent of instructor.

436, 636 Wood as an Energy Source 2(2,0)S Study of the availability, characteristics, and processing required for using wood and bark as a source of energy. *Preq:* Senior standing or consent of instructor.

451, H451, 651 (AGE, ESE) Newman Seminar in Engineering 1(0,2) See AGE 451.

707 Special Problems 1-3(1-3,0)

801 Data Processing in Forestry Problems 3(2,3)

802 Advanced Mensuration 3(2,3)

803 Photo Interpretation 3(2,3)

804 Advanced Forest Economics 3(2,3)

805 Forest Landscape Ecosystems 3(3,0)

806 Advanced Silviculture—Forest Tree Growth and Development 3(3,0)

807 Special Problems in Forestry. Credit to be arranged.

808 Seminar 1(1,0)

809 Products Biodeterioration 3(2,3)

825 Wood Chemistry 3(2,3)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

FRENCH (FR)

Professors: M. Cranston, R. R. McGregor, Jr., H. E. Stewart; *Associate Professors:* P. R. Heusinkveld, J. A. McNatt; *Assistant Professors:* D. Y. Brannock, Jr., D. J. Calvez, S. C. King, J. B. Macy, J. M. Sharkey, K. M. Szmurlo; *Instructor:* R. Willingham; *Visiting Instructor:* M. P. Boyer

101, H101 Elementary French 4(3,1) A course for beginners in which, through conversation, composition, and dictation, the fundamentals of the language are taught and a foundation is provided for further study and the eventual ability to read and speak the language. Three hours a week of classroom instruction and one hour a week in the language laboratory.

102, H102 Elementary French 4(3,1) Continuation of FR 101; three hours a week of classroom instruction and one hour a week in the language laboratory.

151 French for Graduate Students 3(3,0) Intensive program only for graduate students preparing for the reading examination in French. A minimum grade of B on final exam will satisfy graduate school foreign language requirement. May be repeated once for credit. *Preq:* Graduate standing.

196 Practicum in French 1(0,1) On-campus program of teaching foreign languages to children. Students work under the supervision of faculty in planning and teaching one 45-minute class per week to children in grades 1-8. May be repeated for a total of 3 credits. *Preq:* Third year language standing or consent of department head.

198 Situational French 4(3,2) Intensive course relating to a student's field of study. Designed primarily for non-Liberal Arts majors preparing for employment or study abroad. Subsequent

placement into FR 201 or 205 by departmental examination. Only for elective credit in the College of Liberal Arts. Cannot be counted toward any Bachelor of Arts language requirements.

199 Situational French 4(3,2) Continuation of FR 198. Subsequent placement into FR 201 or 205 by departmental examination. Only for elective credit in the College of Liberal Arts. Cannot be counted toward any Bachelor of Arts language requirements. *Preq:* FR 198 or consent of instructor.

201, H201 Intermediate French 3(3,0) A brief review of FR 101 and 102, with conversation, composition, and dictation, and the reading of more serious short prose pieces in French. *Preq:* FR 102.

202, H202 Intermediate French 3(3,0) While attention is paid to writing and speaking French, more stress is laid on the rapid reading of more difficult French prose than in the earlier courses. *Preq:* FR 201.

205 Elementary French Conversation and Composition 3(3,0) Intensive oral and written training in French through conversation groups, speeches, written composition, and controlled vocabulary acquisition. Required of all French majors and minors. May be taken concurrently with FR 202, 301 or 302. *Preq:* FR 201.

209 Introduction to French Phonetics 3(3,0) Study of the fundamental principles of the pronunciation of French through the use of the International Phonetic Alphabet and recordings. This course may not be used toward the satisfaction of the foreign language requirement in the Bachelor of Arts curriculum. *Preq:* FR 201 or equivalent.

299 Foreign Language Drama Laboratory 1(0,3) Participation in foreign language drama productions. No formal class meetings, but an average of three hours per week in a foreign language drama workshop for production. May be repeated for a total of three credit hours. *Preq:* Consent of instructor directing the play.

301 Survey of French Literature I 3(3,0) French literary movements and authors of the 19th and 20th centuries. *Preq:* FR 202.

302 Survey of French Literature II 3(3,0) French literary movements and authors from the Middle Ages through the 18th century. *Preq:* FR 202.

305 Intermediate French Conversation and Composition I 3(3,0) Practice in the spoken language, with stress on vocabulary building, pronunciation, intonation, and comprehension; written work to increase accuracy. Assignments in the language laboratory. *Preq:* FR 202 or consent of department head.

307 French Civilization 3(3,0) Study of the significant aspects of the culture of France from its origins to the present. *Preq:* FR 202 or consent of department head.

316 French for International Trade I 3(3,0) Spoken and written French common to the French-speaking world of business and industry, with emphasis upon business practices and writing and translating business letters and professional reports. Cross-cultural references provide opportunity for comparative and contrastive analysis of American and French cultural patterns in a business setting. *Preq:* FR 202 and 305 (either *preq* or concurrently); or consent of department head.

398 Directed Reading 1-3(1-3,0) Directed study of selected topics in French literature, language, and culture. May be repeated for a maximum of six credits. *Preq:* Consent of department head.

403 Twentieth-Century French Prose and Poetry 3(3,0) The major literary themes and genres of the period and their influence upon other art forms. *Preq:* FR 301 or 302.

404 Twentieth-Century French Drama 3(3,0) Survey of French drama and its relationship to other literary and art forms. *Preq:* FR 301 or 302.

405 Nineteenth-Century French Romanticism 3(3,0) The Romantic Movement as expressed in the works of its principal exponents during the century. *Preq:* FR 301 or 302.

406 Nineteenth-Century French Literary Movements 3(3,0) Study of genres representative of the literary theories which contributed to the great diversity of the literature, painting, and music of the period. *Preq:* FR 301 or 302.

407 Eighteenth-Century French Literature 3(3,0) The principal literary figures of the 18th-century, with particular emphasis on Voltaire and Rousseau. *Preq:* FR 301 or 302.

408 Seventeenth-Century French Literature 3(3,0) Major literary figures, themes, and forms of 17th-century French literature. *Preq:* FR 301 or 302.

409 Advanced Grammar and Composition 3(3,0) Intensive study of syntax and stylistics through composition and translations. *Preq:* Senior standing or consent of department head.

411 Advanced French Conversation and Composition 3(3,0) Continuation of FR 305, with emphasis on greater fluency and sophistication in oral and written expression. *Preq:* FR 305 or consent of instructor.

416 French for International Trade II 3(3,0) Study of language and cultural environment of the French-speaking markets of the world, including the linguistic and cultural idioms which support global marketing in general and the international marketing of textiles, agricultural products, and tourism in particular. *Preq:* FR 316.

498 Independent Study 1-3(1-3,0) Directed study of selected topics in French literature, language, and culture. May be repeated for a maximum of six credits. *Preq:* Consent of department head.

499, 699 Selected Topics in French Literature 3(3,0) Selected topics that have characterized French literature, language, and culture. May be repeated for a maximum of six credits. *Preq:* Consent of department head.

GENETICS (GEN)

Professors: P. M. Burrows, W. D. Graham, Jr., R. H. Hilderman, E. L. Kline, J. S. Rice;
Associate Professors: W. C. Bridges, Jr., E. R. Shipe, W. M. Surver, D. G. Yardley; *Assistant Professors:* A. G. Abbott, N. W. Ferguson

301 Genetics and Human Affairs 3(3,0)S, SS Basic genetic principles emphasizing human heredity and the relationship of genetics to society. Discussion of chromosome abnormalities, inborn errors of metabolism, sex-related traits, genetic counseling, and other current genetic topics. Course is designed as an elective for students in nonbiological science majors. Will not substitute for GEN 302.

302, H302 Introductory Genetics 4(3,3) Basic course introducing fundamental principles of inheritance in prokaryotes and eukaryotes. Emphasis is given to Mendelian genetics, physical and chemical basis of heredity, population genetics, and microbial genetics. *Preq:* One year of introductory biology or consent of instructor.

405, 605 Molecular Genetics 3(3,0)S Course emphasizing molecular aspects of genetics in eukaryotes in relation to gene and chromosomal structure, the control of gene expression, developmental genetics, somatic cell genetics, and extra nuclear genetics. Designed to follow an introductory genetics course. *Preq:* GEN 302 or its equivalent and one semester of biochemistry, or consent of instructor. A developmental biology course is also strongly recommended.

451, 651 Advanced Genetics 3(3,0)F Even-numbered years. Advanced study of the principles of general genetics. Topics emphasized are variations in chromosome number and structure, natural and induced mutations, extranuclear inheritance, recombination, control of gene activity, genes and development, genetics of behavior patterns, population genetics, systems of mating, genetics and man. *Preq:* GEN 302 or equivalent.

701 Modern Development in Genetics 3(3,0)

801 Cytogenetics 3(2,3)

803 Biometrical Genetics 3(3,0)

806 Special Problems in Genetics 1-3(0,3-9)

890 Special Topics in Genetics 1-3(1-3,0)

GEOGRAPHY (GEOG)

Associate Professor: J. A. Miller; *Assistant Professor:* L. E. Estaville, Jr.

101 Introduction to Geography 3(3,0) Introduction to the tools, language, methodologies, and basic concepts of geography as a social science.

102 Human Geography 3(3,0) Introduction to modern geography as the study of environment, population, resources, and technology. Emphasis is placed on the human impact on natural systems of air, water, and land.

301 Political Geography 3(3,0) The geographic basis for and the geographical problems of the modern state; the relevance of geographical patterns of international affairs. *Preq:* GEOG 101 or 102.

302 Economic Geography 3(3,0) The geographic conditions fundamental to the world's resources (agricultural, mineral, commercial, and industrial), and the conditions which affect the utilization, marketing, consumption, and strategic significance of those resources. *Preq:* GEOG 101 or 102.

303 Urban Geography 3(3,0) Geographic survey of urban structures and environment. Topics include definitions of cities and urban characteristics, geography of cities in world history, contemporary city, urban land use, and social geography. Fieldwork in the South Carolina urban environment is required and culminates in a problem-oriented class project. *Preq:* GEOG 101 or 102.

304 Geography of South Carolina 3(3,0) Geographical perspective of the economic, social, and political development of South Carolina landscapes.

310 Computer Mapping 3(3,0) Introduction to computer mapping and to microcomputer and mainframe computer mapping application packages.

330 Geography of the Middle East and North Africa 3(3,0) Thematic survey of a world region extending from Morocco to Afghanistan. Emphasis on climate, environment, social geography, historical development of the regional culture of Islam, and common problems facing the area today.

340 Geography of Latin America 3(3,0) Introduction to the physical, economic, political, and human/cultural geography of Latin America. Special focus on regional unity and diversity and on the historical interaction of man and environment.

401, 601 Studies in Geography 3(3,0) Intensive study of the geography of a selected world region, such as North America, Europe, or the Middle East, or the geography of a topic such as the geography of oil or the geography of underdevelopment. With departmental permission, may be repeated once for credit. *Preq:* GEOG 101 or 102 or consent of instructor.

700 Topics in Geography 3(3,0)

710 Problems in Teaching Geography 3(3,0)

GEOLOGY (GEOL)

Professors: V. S. Griffin, Jr., G. M. Haselton, D. S. Snipes, C. W. Ulbrich, *Acting Head*; *Associate Professor:* R. D. Warner; *Assistant Professor:* J. R. Wagner; *Lecturer:* J. G. Stillwell

101 Physical Geology 3(3,0) Study of the minerals and rock which compose the earth's crust, their origins and transformations. Emphasis is placed upon geological processes, both internal and external, by which changes are produced on or in the earth.

102 Historical Geology 3(3,0) Survey of the geologic history of the earth. Emphasis is placed upon how earth's continents and ocean basins have evolved through geologic time. The evolution of life is traced from the beginning of the fossil record through the present. *Preq:* GEOL 101.

103 Physical Geology Laboratory 1(0,2) Laboratory to accompany GEOL 101. Instruction is provided in the identification of minerals and rocks and in the interpretation of geologic processes through study of topographic maps. Field trips provide direct observation of processes and results. *Coreq:* GEOL 101.

104 Historical Geology Laboratory 1(0,3) Laboratory to accompany GEOL 102. Instruction is provided in the identification of plants and animals which have left their record as fossils in the rocks of the earth's crust. Interpretation of the past history of the earth through study of geologic maps. Field trips illustrate principles. *Coreq:* GEOL 102.

210 Geology of the National Parks 3(3,0) Survey of selected national parks and monuments emphasizing the dynamic geological processes which have shaped the landscapes of these areas. Special attention will be focused on parks exhibiting recent geological activity related to volcanoes, earthquakes and glaciers. Slides and films will be used to highlight specific geological features.

220 (ASTR) Planetary Science 3(3,0) Survey of the formation and evolution of planetary bodies. Emphasis is placed upon the origin of planetary material and comparative study of the primary processes operative on planetary surfaces. The major features of the planets and moons in our solar system, as revealed by recent space missions, are described.

306 Mineralogy 3(2,3) Introduction to fundamental concepts of crystallography and crystal chemistry. Topics include crystal symmetry, principles of crystal structures, introductory x-ray crystallography, composition and stability of minerals, and systematic mineralogy. Laboratory exercises emphasize the recognition of crystallographic features and identification of minerals based on their physical properties.

309, H309 Petrology 3(2,3) Genesis, evolution, and classification of rocks through lectures, laboratory exercises, and field trips. The occurrences, chemical relationships, and distribution of rock types are emphasized. *Preq:* GEOL 306.

400, 600 Environmental Geology 3(3,0) Discussion-oriented introductory study of the relationships of man to his physical surroundings and the problems resulting from upsetting the established equilibria of geologic systems; man's role as a geologic agent, environmental conservation and management.

401,601 Applied Geophysics 3(2,2) Introduction to the most important methods of geophysical exploration and their application to the investigation of subsurface groundwater and mineral resources. Emphasis is on the principles, techniques, interpretations and limitations of magnetic, gravimetric, electrical, electromagnetic, well-logging and seismic geophysical surveys. *Preq:* GEOL 101 or consent of instructor; PHYS 208 or 221 recommended.

402, H402, 602 Structural Geology 3(2,2) The diverse geological structures of the earth, their description, origin, and field recognition. Practical problems in interpreting geologic structures are utilized, in addition to theoretical considerations of the mechanics and causes of tectonism. *Preq:* GEOL 101.

403, H403, 603 Invertebrate Paleontology 3(2,3) Study of life of past geologic ages, as shown by fossilized remains of ancient animals, with emphasis on the invertebrates. *Preq:* GEOL 101 or consent of instructor.

404, H404, 604 Economic Geology 3(3,0) This course concerns the description and classification of ore deposits and commercial nonmetallic mineral deposits. The origin of mineral deposits and their occurrence is emphasized. Problem studies and field trips to nearby mines and quarries. *Preq:* GEOL 306.

405, 605 Geomorphology 4(3,3) Study of the surface features of the earth—their form, nature, origin, development, and the change they are undergoing. *Preq:* GEOL 101, 102, or consent of instructor.

407, 607 Quaternary Geology 3(2,2) Early concepts about glaciation. Types and distribution of glaciers today and during their maximum extent. Glacial erosion, transportation and ice-sculptured terrain features. Study of quaternary sediments and their chronology. Drainage changes, sea level fluctuations and crustal deformation. Detailed study of specific areas as time permits. Field trips.

408, 608 Geohydrology 3(3,0) Study of the hydrologic cycle, aquifer characteristics, theory of groundwater movement, mechanics of well flow, experimental methods, and subsurface mapping. *Preq:* GEOL 101, 102

410, H410, 610 Optical Mineralogy 3(1,5) Involves techniques of mineral identification with the polarizing microscope. Criteria are provided for the determination of optical properties using oil immersion grain mounts. The student is also introduced to the study of minerals and rocks in thin section. Lecture topics explore mineral optics theory. *Preq:* GEOL 306.

411, 611 Research Problems 1-3(0,3-9) Field, laboratory, or library study of an approved topic in geology. Topic would be one not normally covered in formal courses, but may be an extension of a course. Taught either semester and may be taken more than once for a maximum of 6 credits. *Preq:* Senior standing in Geology or consent of instructor.

413, 613 Stratigraphy and Sedimentation 3(3,0) The processes by which sediments are eroded, transported, and deposited (sedimentation), with major emphasis on relationships of the age and time distribution of stratified rocks and their historical significances (stratigraphy). *Preq:* GEOL 101 and 102 or consent of instructor.

700 Earth Science I: Geology for Science Teachers 3(2,3)

711 Earth Science II: Special Topics in Geology for Science Teachers 1(0,2)

740 Earth/Space Science for Elementary Teachers 3(2,3)

790 Special Institute Course: Selected Topics in Earth Science 1-6(0-6,0-18)

GERMAN (GER)

Professors: H. M. Riley, M. M. Sinka; *Associate Professor:* J. M. Melton, *Head;* *Assistant Professor:* E. P. Arnold

101, H101 Elementary German 4(3,1) A course for beginners in which, through conversation, composition and dictation, the fundamentals of the language are taught and a foundation is provided for further study and the eventual ability to read and speak the language. Three hours a week of classroom instruction and one hour a week in the language laboratory.

102, H102 Elementary German 4(3,1) Continuation of GER 101; three hours a week of classroom instruction and one hour a week in the language laboratory.

151 German for Graduate Students 3(3,0) Intensive program only for graduate students preparing for the reading examination in German. A minimum grade of B on a final examination will satisfy graduate school foreign language requirement. May be repeated once for credit. *Preq:* Graduate standing.

196 Practicum in German 1(0,1) An on-campus program of teaching foreign languages to children. Students work under the supervision of faculty in planning and teaching one 45-minute class per week to children in grades 1-8. May be repeated for a total of 3 credits. *Preq:* Third year language standing or consent of department head.

198 Situational German 4(3,2) Intensive course relating to a student's field of study. Designed primarily for non-Liberal Arts majors preparing for employment or study abroad. Subsequent placement into GER 201 or 205 by departmental examination. Only for elective credit in the College of Liberal Arts. Cannot be counted toward any Bachelor of Arts language requirements.

199 Situational German 4(3,2) Continuation of GER 198. Subsequent placement into GER 201 or 205 by departmental examination. Only for elective credit in the College of Liberal Arts. Cannot be counted toward any Bachelor of Arts language requirements. *Preq:* GER 198 or consent of instructor.

201, H201 Intermediate German 3(3,0) Brief review of GER 101 and 102, with conversation, composition and dictation, and the beginning of more serious reading of German prose in short stories and plays. *Preq:* GER 102.

202, H202 Intermediate German 3(3,0) Emphasis on reading nontechnical German prose more rapidly. Writing, speaking, and listening skills will continue to be developed. *Preq:* GER 201 or consent of instructor.

205 Elementary German Conversation and Composition 3(3,0) Intensive oral and written training in German through conversation groups, speeches, written compositions, and controlled vocabulary acquisition. Recommended for all German majors. *Preq:* GER 201. *Coreq:* GER 202, 301 or 302.

251 Scientific German 3(3,0) An alternate course to GER 202, especially for students in the sciences. Readings will be chosen from various fields. Grammar and syntax will be reviewed to ensure accurate translations, but stress will be on reading for understanding. *Preq:* GER 201 or consent of department head.

299 Foreign Language Drama Laboratory 1(0,3) Participation in foreign language drama productions. No formal class meetings, but an average of three hours per week in a foreign language drama workshop for production. May be repeated for a total of three credit hours. *Preq:* Consent of instructor directing the play.

301 Twentieth-Century German Drama 3(3,0) Selected works from major German-speaking dramatists of the 20th-century, including Brecht, Duerrenmatt, and Frisch. Required of German majors. *Preq:* GER 202 or consent of department head.

302 Twentieth-Century German Prose and Poetry 3(3,0) Selected prose and poetry from major 20th-century German-speaking authors, including Rilke, Mann, Hesse, Kafka, and Boell. Required of German majors. *Preq:* GER 202 or consent of department head.

305 Intermediate German Conversation and Composition 3(3,0) Practice in the spoken language, with emphasis on vocabulary, pronunciation, and comprehension; written exercises for accuracy. Required of German majors. *Preq:* GER 202, 205, or consent of department head.

308 German Civilization 3(3,0) Study of significant aspects of the culture of the German-speaking peoples from their origins to 1945. *Preq:* GER 202 or consent of department head.

309 Modern German Culture 3(3,0) Study of modern German culture from 1945 to the present with particular emphasis on the Federal Republic of Germany and significant aspects pertaining to the German Democratic Republic. *Preq:* GER 202 or consent of department head.

316 German for International Trade I 3(3,0) Spoken and written German common to the German-speaking world of business and industry, with emphasis upon business practices and writing and translating business letters and professional reports. Cross-cultural references provide opportunity for comparative and contrastive analysis of American and German cultural patterns in a business setting. *Preq:* GER 251 or 202 and 305 (*preq* or concurrently); or consent of department head.

398 Directed Reading 1-3(1-3,0) Directed study of selected topics in German literature, language, and culture. May be repeated for a maximum of six credits. *Preq:* Consent of department head.

400 Goethe and His Age 3(3,0) Study of the most significant period of German literature, with readings from works by Goethe, Schiller, and the Romantics. Supplementary materials may include audio visuals and documents on the music, art, and science of the period. Recommended for German majors. *Preq:* GER 301, 302, or consent of department head.

401 Studies in German Literature I 3(3,0) Selected topics in German literature from the beginning to 1832. *Preq:* GER 301, 302, or consent of department head.

402 Studies in German Literature II 3(3,0) Study of selected topics in 19th or 20th century German literature. *Preq:* GER 301, 302, or consent of department head.

403 Studies in German Literature III 3(3,0) Study of a major theme in German literature within a chosen time period or in the work of one major author. The themes may be subject- or genre-oriented. *Preq:* GER 301, 302, or consent of department head.

411 Studies in the German Language I 3(3,0) Advanced training in the spoken and written language with emphasis on vocabulary, syntax, and stylistics. *Preq:* GER 305 or consent of department head.

412 Studies in the German Language II 3(3,0) In-depth study of terminology and syntax for specific subject areas in business, in the liberal arts, and in the sciences. *Preq:* GER 301, 302, 305, or consent of department head.

413 Studies in German Culture 3(3,0) Intensive study of selected topics concerning cultural phenomena of the German-speaking nations. *Preq:* GER 301, 302, 305, or consent of department head.

416 German for International Trade II 3(3,0) Study of language and cultural environment of the German-speaking markets of the world, including the linguistic and cultural idioms which support global marketing in general and the international marketing of textiles, agricultural products, and tourism in particular. *Preq:* GER 316.

498, 698 Independent Study 1-3(1-3,0) Supervised study of selected topics in German literature, language, or culture. May be repeated for a maximum of six credits. *Preq:* Consent of department head.

GRADUATE STUDIES (GS)

799 Comprehensive Studies 1-15

GRAPHIC COMMUNICATIONS (GC)

101 Orientation to Graphic Communications 1(1,0) Introduction to the curriculum and the industry including its processes, products, and careers. Emphasis is placed on the attributes which are most desirable for successful entry and advancement up a variety of career ladders.

104 Graphic Arts I 3(1,6) Major emphasis is placed on the basic principles underlying the graphic arts. Many areas of study include general photography, graphic layout and design, process photography, offset lithography, screen printing, and bindery. Modern industrial applications are stressed throughout the course.

207 Graphic Arts II 3(1,6) Continuation of GC 104. An intermediate course for the graphic communications and graphic arts specialists which broadens skills and technical knowledge in areas of layout, copy preparation, reproduction photography, film assembly, screen printing, lithographic presswork, and finishing. *Preq:* GC 101, 104, typewriter/computer keyboarding skills of 20 net words per minute.

304, H304 Photographic Techniques 3(1,6) Emphasis is placed on application of black and white photography as activities for vocation and avocation. Sufficient laboratory experiences are provided to assure confidence in the use of photographic techniques. Problems encountered in action, portrait, still life, and character-study photography are considered.

350 Graphic Communications Internship I 1(0,3) Full-time supervised employment in an industrial in-plant setting for expansion of experience with materials and processes, production people, and organizations. *Preq:* GC 104 or 207 or equivalent and consent of instructor.

406, H406, 606 Problems in Specialty Printing 4(2,6) Study of the problems and processes for printing and converting in package label and specialty industries. Laboratory applications include flexographic preparation, printing, and die cutting; die making and die cutting screen and offset printed sheet stock; sublimation and plastisol transfer printing; plastic and metal container printing. *Preq:* GC 207 and INED 105.

440, H440, 640 Advanced Lithographic Methods 4(2,6) Students selecting to pursue the area of graphic arts will gain experience in the development of advanced techniques of layout and design; photographic copy preparation; cold type composition; line, halftone, duotone, and special-effects photography, full color reproduction and advanced platemaking; process stripping, and color off-set presswork. *Preq:* GC 207.

444, H444, 644 Current Developments and Trends in Graphic Communications 3(2,3) Study of commercial and industrial printing control. Emphasis is placed upon consideration for decision making in the areas of process and equipment selection and plant layout. Other topics include production flow, cost analysis, and recent developments as they affect production. *Preq:* GC 350 and 406, 440.

448, H448, 648 Planning and Controlling Printing Functions 3(3,0) Study of systems for setting printing production standards, estimating, scheduling, job planning, and the selection of new hardware and technologies. *Preq:* GC 350, 406, 440, 450.

450 Graphic Communications Internship II 1(0,3) Continuation of GC 350. *Preq:* GC 350, 440 and/or consent of instructor.

451 Special Projects in Graphic Communications 1-6(0,3-18) Advanced projects covering theory and/or practices going beyond the scope of regular coursework. Written project approval required before registering. *Preq:* Junior or Senior with three graphic communication courses completed.

801 Process Control in Color Reproduction 3(2,3)

HEALTH (HLTH)

298 Health Maintenance 3(3,0) Study of good health practices. Emphasis on lifestyles and measures of health. Not open to Nursing majors.

301 Medications in Health Care 3(3,0) Exploration of the use of medications in the maintenance of health, with emphasis on the consumer's responsibility and informed decision-making. Not open to Nursing majors. *Preq:* A two-semester sequence in science or consent of instructor.

310 Women's Health Issues 3(3,0) Exploration of the specific health needs of women, with emphasis on understanding and prevention of problems of women's health. Not open to Nursing majors. *Preq:* A two-semester sequence in science or consent of instructor.

320 Health Maintenance of Men 3(3,0) Exploration of the specific health maintenance needs of men, with emphasis on understanding and prevention of problems of men's health. Not open to Nursing majors. *Preq:* A two-semester sequence in science or consent of instructor.

401, 601 Health Care Consumerism 3(3,0) Exploration of the relationship of the consumer to health-care options with emphasis on strategies for appropriate decisions regarding health care. Not open to Nursing majors. *Preq:* A two-semester sequence in science or consent of instructor.

402, 602 Health Care in Emergencies 3(3,0) Study of basic emergency care for people who are injured or suddenly become ill. Immediate first aid and follow-up care explored. Emphasis is on safety and the role of nonmedical personnel in caring for victims of accidents, disasters, poisonings, and serious or life-threatening injuries. Not open to Nursing majors. *Preq:* Two-semester sequence in biology or anatomy and physiology or consent of instructor.

410, 610 Concepts of Health for Children 3(3,0) Focus on the analysis and evaluation of health problems commonly occurring in children. Emphasis will be on concepts of positive health behavior. Not open to Nursing majors. *Preq:* A two-semester sequence in science or consent of instructor.

498, 698 Health Problems in Contemporary Society 3(3,0) Current and emerging health problems in contemporary society with emphasis on risk factors, interactive treatment effects, and prevention. Not open to Nursing majors. *Preq:* A two-semester sequence in science or consent of instructor.

HISTORY (HIST)

Professors: J. L. Arbena, *Acting Head;* C. K. Bleser, R. M. Golden, D. M. McKale, E. E. Moise, J. V. Reel, Jr., A. Schaffer, R. A. Waller; *Associate Professors:* E. D. Carney, T. J. Kuehn, J. A. Miller, D. G. Paz, R. L. Saunders, Jr., W. F. Steirer, Jr., H. L. Suggs; *Assistant Professors:* L. Dorsey, L. E. Estaville, Jr., C. A. Grubb, R. P. Leemhuis, P. E. Mack, S. G. Marks, R. R. Owens; *Visiting Associate Professor:* B. S. Ledbetter; *Visiting Assistant Professors:* B. Y. Kunze, M. C. Satre, F. C. Suppe, R. L. Vice; *Adjunct Professor:* W. Wates; *Adjunct Associate Professor:* M. R. Heintze; *Adjunct Assistant Professor:* J. W. Mauer

100 Higher Education and Clemson 1(1,0) Introduction to higher education. Its background and development in the western world, emphasizing land-grant institutions and Clemson University in particular.

101, H101 History of the United States 3(3,0) The political, economic, and social development of the American people from the period of discovery to the end of Reconstruction.

102, H102 History of the United States 3(3,0) Political, economic, and social development of the American people from the end of Reconstruction to the present.

172, H172 Western Civilization 3(3,0) Political, economic, and social movements of Western civilization from ancient times to the 17th century.

173, H173 Western Civilization 3(3,0) Political, economic, and social movements of Western Civilization from the 17th century to the present.

191 The World in the Twentieth Century 3(3,0) History of the world in the 20th century which integrates American, European, and non-Western development and which traces the historical roots of contemporary issues in politics, economics, international relations, society, culture, and the arts. Cannot substitute for the HIST 172/173 requirement in the College of Liberal Arts.

198 Current History 1(1,0) Examination of the major events and problem areas in the news with emphasis on their historical context and possible long-range significance. May be taken a total of three times for credit. Does not count toward the requirements of the major or minor in History.

300 History of Colonial America 3(3,0) Development of American institutions and customs in the period before 1776. Considerable emphasis is placed on the imperial relations between Great Britain and her colonies and upon the movement towards and the philosophy of the American Revolution.

301 American Revolution and the New Nation 3(3,0) Study of the various historical explanations leading to an understanding of the American Revolution, the establishment of the Nation under the Constitution, and the first decade of the new nation. Special emphasis will be placed upon developing an understanding of individual motivation and ideological development present during the last four decades of the 18th century.

302 Age of Jefferson, Jackson, and Calhoun 3(3,0) Formation and growing pains of the new nation through the Federal and Middle periods of its history, with emphasis on economic and political development, the westward movement, and the conflicting forces of nationalism and sectionalism.

303 Civil War and Reconstruction 3(3,0) Study of the political, military, and social aspects of the sectional conflict and of the era of Reconstruction. Some emphasis will be placed in the historical controversies which the period has inspired.

304 Industrialism and the Progressive Era 3(3,0) Study of American society in the period between 1880 and 1930s. This course emphasizes the effects of industrialization and urbanization on the American people.

305 United States Since 1933 3(3,0) Particular emphasis will be given to the Great Depression, World War II, the Cold War, and domestic developments in the 1950s and 1960s.

306 American Economic Development 3(3,0) Economic development of the United States from Colonial to recent times, emphasizing the institutional development of agriculture, banking, business and labor, and government regulations and policy.

- 307 Recent United States Diplomatic History 3(3,0)** History of American foreign policy from the late 19th century to the present, showing the rise of America's world interests and gradual involvement in global affairs. Emphasis is placed on the role of public opinion in foreign policy.
- 308 American Legal History 3(3,0)** Survey of the American legal system in its historical perspective, from Colonial time to the present. Emphasis will be placed on the relationship between law and society, the way in which the practice of law changes American society, and the way in which social development affected both the theory and practice of the law.
- 309 History of Technology 3(3,0)** History of the major developments in Western technology with an emphasis on specific technologies and their relationships to the societies and cultures in which they flourished.
- 310 History of American Technology 3(3,0)** History of developments in technology and their role in American life with particular emphasis on the American Industrial Revolution and the 20th century.
- 313 History of South Carolina 3(3,0)** Political, economic, and social development of South Carolina from 1670 to the present.
- 314 History of the South 3(3,0)** Origins and development of political, economic, and cultural institutions of the South from the Colonial period to the present, and the role of the South in the nation's development.
- 315 Black History in America 3(3,0)** Study of the Afro-American experience in the United States, from the African past, through slavery, to the present.
- 316 American Social History 3(3,0)** Study of American society, including the relationship among classes, ethnic groups, regions, and sexes, from the Colonial period to the present.
- 317 The Trans-Appalachian Frontier 3(3,0)** Consideration of the American frontier between the Atlantic coast and the Mississippi River, through the mid-1800s.
- 318 History of American Women 3(3,0)** Survey course of the history of American Women emphasizing the changing role of women in American culture and society.
- 321 History of Science 3(3,0)** Survey of the development of science in the Western world, emphasizing the period from the Renaissance to the present.
- 330 History of Modern China 3(3,0)** Growth and development of Chinese civilization from ancient times to the present. Emphasis in the course is on 20th century China, particularly since the rise to power of the Communist regime.
- 333 History of Modern Japan 3(3,0)** The origin and development of Japanese civilization with particular emphasis on modern Japan from mid-19th century to the present.
- 340 Ancient Americans 3(3,0)** Introduction to the geography of the Western Hemisphere; origin of human life in the Americas; structure and accomplishments of the major pre-Columbian societies, with an emphasis on the rise and decline of the Classic civilizations; the impact of the European conquest; the formation of a new Ibero-American culture.
- 341 Modern Mexico 3(3,0)** Introduction to the geography of the region, origins, and progress of the Independence movements and political, economic and social developments after 1825; current domestic and international problems.
- 342 South America Since 1800 3(3,0)** Introduction to the geography of the region; origins and progress of the Independence movements; political, economic and social developments after 1825; current domestic and international problems.
- 351 Ancient Near East 3(3,0)** History of the peoples and civilizations of the Near East from the Sumerians to the establishment of Roman power in this region. Geography, mythology, religious and economic currents, as well as the methods and discoveries of archaeology will be included.
- 354 The Greek World 3(3,0)** Study of Greek civilization from its beginning until the time of the Roman conquest, concentrating on the social institutions of the Greek city-states.
- 355 The Roman World 3(3,0)** The rise of Rome to world empire and the international civilization it dominated. Concentration on the nature of the political change from Republic to monarchy with particular emphasis on city life and the causes of its decline.

361 History of England to 1603 3(3,0) The evolution of English political, social, economic, and cultural institutions to the 17th century. (Study Abroad)

363 History of England Since 1603 3(3,0) The evolution of English political, social, economic, and cultural institutions from the 17th century to the present.

365 English Cultural History 3(3,0) Survey of the cultural history of England, from Anglo-Saxon times to the present, focusing on the period after the English Renaissance.

370 Medieval History 3(3,0) Survey of the period from the eclipse of Rome to the advent of the Renaissance, emphasizing human migrations, feudalism, rise of towns, and cultural life.

372 The Renaissance 3(3,0) Examination of the transitional period of European civilization (ca. 1300-1500), with emphasis on institutional, cultural, and intellectual developments.

373 Age of the Protestant Reformation 3(3,0) Evolution of Modern Europe (ca. 1500-1660), as affected by the Reformation, wars of religion and growth of nation-states. The study will include intellectual advances and the beginnings of European expansion overseas.

374 Europe in the Age of Reason 3(3,0) Study of the quest for order and the consolidation of the European state system between 1660 and 1789 with emphasis on the idea of absolutism, the question of French hegemony, and the synthesis of the 18th century Enlightenment.

375 Revolutionary Europe 3(3,0) History of Europe from the outbreak of the French Revolution through the Revolutions of 1848, with emphasis on the conflict between the forces of change and those of conservation, within the states and in Europe in general.

377 Europe in Crisis, 1914 to the Present 3(3,0) Study of the political, economic, and social institutions of the European peoples from 1914 to the present. Attention will be given to the world wars and to the collapse of the European state-system.

380 Imperial Germany 3(3,0) German history from the beginning of the German Empire, 1870-71, through World War I. This course emphasizes the influence of militarism, nationalism, anti-Semitism and xenophobia on the German culture and political process.

381 Germany Since 1918 3(3,0) German history from the time of Germany's defeat in World War I, through the Nazi period and World War II. This course culminates with the study of a divided Germany.

384 History of Modern France 3(3,0) French history from the mid-19th century to the present with particular emphasis on France since 1900.

385 History of Imperial Russia 3(3,0) Survey of the formative years of the Russian Empire from the time of accession of Peter the Great to the time of the Russian Revolution. Social, political, diplomatic, and intellectual developments will be given equal treatment in the course.

386 History of Modern Russia 3(3,0) Russian history in the 20th century. Emphasis is on the Russian revolution of 1917 and on Russian development under Lenin, Stalin, and the leadership of the Communist Party.

390 Modern Military History 3(3,0) Survey of the development of modern warfare, and the influence of technological change on warfare. Particular attention will be given to the major conflicts of the 20th century.

With departmental consent, any 400-level course in history may be repeated one time for credit. The 400-level courses require students to do historical research and writing.

400, 600 Studies in United States History 3(3,0) Topics and problems in the history of the United States from the Colonial era to the present.

440, 640 Studies in Latin American History 3(3,0) Consideration of selected and varied topics in Latin American history through readings, class discussions, and individual or group projects. Special attention will be given to the use of an inquiry or problem-solving method of historical analysis and to the cultivation of a comparative perspective.

450, 650 Studies in Ancient History 3(3,0) Selected topics in the field of ancient history ranging from pre-Biblical times to the fall of the Roman Empire.

460, H460, 660 Studies in British History 3(3,0) Examination of selected themes, topics, or periods in British history from Anglo-Saxon times to the present.

470, 670 Studies in Early European History 3(3,0) Study of selected topics or themes in European history from the fall of the Roman Empire to the age of industrialization.

471, 671 Studies in Modern European History 3(3,0) Study of selected topics or problems in European history from the end of the Old Regime to the present.

491, H491, 691 Studies in the History of Science and Technology 3(3,0) Selected topics in the development of science and technology, with emphasis on their social, political and economic effects.

492, 692 Studies in Diplomatic History 3(3,0) Selected topics and problems in international conflict and conflict resolution among nations. Concentration will usually be in 20th century history.

493, 693 Studies in Social History 3(3,0) Studies in the ways people have earned their livings and lived their lives, individually and as communities, in the confines of different societies.

494, 694 Studies in Comparative History 3(3,0) Selected topics in comparative history, contrasting and comparing similar historic developments in different nations, geographic areas, or civilizations.

495, 695 Studies in the History of Ideas 3(3,0) Selected topics and themes in the development of ideas that have had an impact on the behavior of individuals and civilizations.

496, 696 Studies in Legal History 3(3,0) Study of selected problems in the development of law and the system of criminal and civil justice.

H497 Senior Honors Research 3(3,0) Research for the preparation of senior honors thesis. *Preq:* Senior standing and successful completion of a 400-level history course and approval of the Department of History.

H498 Senior Honors Thesis 3(3,0) Writing of the senior honors thesis. *Preq:* HIST H497.

499 Independent Study 1-3(1-3,0) Study of selected problems in history under the direction of a faculty member chosen by the student. The student and faculty member develop a course of study designed for the individual student and approved by the head of the department prior to registration.

700 United States Through the Civil War 3(3,0)

710 United States Since 1865 3(3,0)

720 Southern History 3(3,0)

760 British History 3(3,0)

770 Europe to the Eighteenth Century 3(3,0)

775 Europe Since the Eighteenth Century 3(3,0)

790 Historical Area Studies 3(3,0)

800 Seminar in United States History 3(3,0)

830 Seminar in Asian History 3(3,0)

840 Seminar in Latin American History 3(3,0)

860 Seminar in British History 3(3,0)

870 Seminar in European History 3(3,0)

880 Special Topics in History 3(3,0)

885 Independent Study 3(3,0)

887 Archival Management: An Introduction 3(3,0)

888 Historical and Textual Editing 3(3,0)

891 Master's Research. Credit to be arranged.

893 Practicum in Archival Management 3(3,0)

HORTICULTURE (HORT)

Professors: J. A. Brittain, R. G. Halfacre, M. T. Haque, R. D. Lineberger, *Head*; A. R. Mazur, L. C. Miller, B. B. Rhodes; *Associate Professors:* D. W. Bradshaw, J. D. Caldwell, J. W. Kelly, A. R. Kingman, A. J. Pertuit, Jr., D. F. Wagner, T. Whitwell; *Assistant Professor:* D. R. Decoteau

101 Horticulture 3(3,0) Environmental factors and horticultural practices affecting optimum production of floral, fruit, ornamental, and vegetable crops. Survey of the various areas of horticulture and their importance to society.

208 Landscape Appreciation 3(3,0)S Designed to deepen the student's appreciation of our natural and built environments through a study of landscape elements, styles, and professions. Landscapes ranging in scale from residential to regional are critiqued, and design principles and landscape ethics are discussed.

303 Plant Materials 3(2,3)F Woody, ornamental plants and their aesthetic and functional uses in landscape developments. The study covers habit of growth, ultimate size, texture effect, period of bloom, color, and cultural requirements.

304 Annuals and Perennials 3(2,3)S Annual and perennial flowers' aesthetic appeal and functional uses and needs. Color, texture, bloom time, form, size and growth requirements as they relate to designing, planting, and maintaining colorful landscapes. *Preq:* HORT 303 or consent of instructor.

305 Plant Propagation 3(2,3)F All phases of plant propagation from seeds, bulbs, divisions, layers cutting, budding, and other types of grafting are comprehensively treated. Timing, manner and material for making cuttings; temperature and media requirements and propagation structures for rooting cuttings of ornamental and fruit trees, shrubs, and indoor plants will be studied.

308 Landscape Design 4(3,3)F Landscape planning of residential and public properties in order to achieve best use and most enjoyment from a given piece of ground. *Preq:* HORT 208, 303, or consent of instructor.

310 Floriculture 3(3,0)S Greenhouse production of commercial flower crops. Studies include fertilizers and insect and disease problems of bench and pot plants. *Preq:* HORT 101.

352, 652 Commercial Pomology 3(2,3)F Fruit bud formation, rest period and water relations of fruit plants, soils, fruit setting; orchard soil management and responses of various fruits to fertilizers; principles of pruning, effect of climatic differences, freezing of tissues and means of avoiding injury; harvesting, transportation and storage. *Preq:* HORT 101.

400 Horticulture Topics 1(1,0) Indepth examination of timely topics in horticultural science. May be repeated for credit, up to 3 credits, as topics vary. *Preq:* Consent of instructor.

406, 606 Nursery Technology 3(2,3)S Principles and techniques in handling nursery crops. *Preq:* HORT 303, 305.

407, 607 Landscape Design 3(2,3)F The first half of this course is a study of trees, shrubs, vines and ground covers used in landscape planting. Attention is given to cultural requirements, growth habits, period of bloom, texture, and fall color. The second half of the course is devoted to landscape planning for small residential properties.

408 Special Problems in Horticulture 1-3(0,3-9) Independent investigation in horticulture. Emphasis will be placed on organizing a quality proposal, conducting the investigation, and reporting of findings at a professional society meeting and/or in a professional publication. Cumulative maximum of 3 credits. *Preq:* Minimum of 75 hours completed and consent of instructor.

409 Seminar 1(1,0)S Recent research work on various phases of horticulture, methods of conducting investigations, and preparation of report of investigations.

412, 612 Turfgrass Management 3(2,3)F Studies of warm and cool season turfgrasses in relation to value, use, regional adaptation, establishment, soils, and cultural practices. The influence of environmental, cultural, and genetic factors on turf quality and serviceability. Identification of grass and weed species and discussion of programs for the management of lawns, parks, roadsides, and golf courses. *Preq:* BIOL 103, 105 or equivalent.

415, 615 Foliage Plants for Interior Utilization 3(2,3)F Application of foliage plant requirements for their selection and maintenance in interior environments. Laboratories include plant identification, experiment, and graphic representation. *Preq:* BOT 205, HORT 101 and consent of instructor.

416 Floral Design 2(1,3)F Topics covered include simple arrangements (history, containers, mechanical aids, etc.), arrangements for specific occasions, church arrangements, funeral designs, bride's bouquets, dried arrangements and flower preservation, corsage work, foliage arrangements, bonsai, terrarium, Christmas wreaths, and foliage plant identification. *Preq:* BIOL 103, 105 or equivalent.

433, 633 (AGRON)S Integrated Weed Management for Agronomic and Horticultural Crops 3(2,2) Weed management systems consisting of cultural, chemical, and biological methods will be studied for the major agronomic and horticultural crops of South Carolina with problem-solving methodology and herbicide injury diagnosis. *Preq:* AGRON 407.

455, 655 Small Fruit Crops 3(2,3)F In-depth survey of taxonomical, morphological, and physiological characteristics of small fruit crops as they relate to the study of horticultural characteristics, culture, production, harvesting, and handling of both commercial and home-grown grapes, blueberries, strawberries, brambles, and kiwifruit. *Preq:* HORT 101 or consent of instructor.

456, 656 Vegetable Crops 4(3,3)S Principles and practices employed in the commercial growing and marketing of vegetable crops with emphasis on plant characteristics, cultivars, management practices, harvest, quality factors and grading, storage, economic importance, and areas of production.

461, H461, 661 Problems in Landscape Design 4(3,3)S Landscape planning for larger residential properties, schools, industrial plants, real estate developments; detailed finished plans; further study of materials used; original problems; field study. *Preq:* HORT 308, 407, or consent of instructor.

462, 662 Landscape Design Implementation 3(2,3)F Implementation of landscape plans, including interpretation of specifications, bidding, planting methods, construction materials and installation methods, irrigation, lighting, and allied landscape specialties. In addition maintenance contracts, equipment, methods, materials, and labor management are studied. *Preq:* HORT 308.

464, 664 Postharvest Horticulture 3(2,2)F Study of the biological aspects of methods and practices relating to the harvesting, handling, transportation, and storage of horticultural commodities for fresh market. Topics include an introduction to postharvest physiology, concept of quality and its measurement, standard and innovative postharvest treatments, grades and standards, and various storage methods.

470, 670 Hortitherapy 3(3,0)S The appeal and techniques involving the art and science of horticulture for exceptional populations will be emphasized. A number of activities suited for almost any therapeutic setting for the visually, physically, and mentally impaired will be planned and conducted. *Preq:* BIOL 103, 105 and consent of instructor.

471, 671 Internship 1-6(0,2-12) Internship under competent supervision in an approved agency dealing with horticultural endeavors. Internships will be designed to provide students with on-the-job horticultural experience. The student will submit monthly reports during the internship and will conduct a departmental seminar at its conclusion. *Preq:* Junior standing and consent of instructor.

701 Horticulture: Plant and Environmental Science 3(2,3)

801 Problems in Small Fruit Production 3(3,0)

802 Research Systems in Horticulture 3(2,3)

803 Experimental Olericulture 3(3,0)

804 Scientific Advances in Ornamental Horticulture 3(3,0)

805 Physiochemical Procedures for Determining Quality in Horticultural Crops 3(2,3)

806 Postharvest Physiology and Handling of Horticultural Crops 3(3,0)

807 Pomology 3(3,0)

809 Seminar I 1(1,0)

810 Seminar II 1(1,0)

812 Special Problems in Horticulture 1-4(1-4,0)

870 Practicum in Hortitherapy 3(1,4)

891 Master's Research. Credit to be arranged.

921 (BOT) Plant Physiology Colloquium 1(1,0)

991 Doctoral Research. Credit to be arranged.

HOSPITAL AND HEALTH SERVICES ADMINISTRATION (HADM)

408, 608 Hospital and Health Services Administration 3(3,0) Survey of how hospital and health-care administration is practiced within the United States. Topics include planning; social, legal, and political considerations; alternate forms of organization; management practices; control systems; and trends/issues facing the future of health-care administrators. *Preq:* Senior or graduate-level standing or consent of instructor.

410, 610 Hospital Internship 3(0,9) The student will spend nine hours per week on a specified program of observing, practicing and experiencing the duties of hospital administrators in selected local hospitals. The course will be specifically outlined along with the amount of time the student will spend in each phase or department of the hospital. Student progress will be constantly monitored by University faculty and hospital staff. *Preq:* HADM 408.

HUMANITIES (HUM)

Professor: J. J. McLaughlin; *Associate Professors:* S. K. Eisminger, E. A. Freeman, V. A. Rudowski

301 Humanities 3(3,0) Introduction to humanistic studies focusing on relationships among disciplines—painting, sculpture, architecture, music, literature, philosophy, and drama—beginning with prehistory and continuing to the Renaissance.

302 Humanities 3(3,0) Introduction to humanistic studies focusing on relationships among disciplines—painting, sculpture, architecture, music, literature, philosophy, and drama—beginning with the 17th century and continuing to the present.

305 Studies in Science, Technology, and the Humanities 3(3,0) Interdisciplinary course that seeks an understanding of science and technology through the perspectives of the liberal arts. Specific subjects vary with the instructor. May be repeated once for credit.

306 Creative Genius in Western Culture 3(3,0) Investigation of creativity through study of great innovators in art, literature, music, and ideas. May be repeated once for credit.

309 Studies in Humanities 3(3,0) Interdisciplinary approach to the humanities. Specific subject matter varies according to the instructor and as approved by the Dean of the College of Liberal Arts. May be repeated once for credit.

INDUSTRIAL EDUCATION (INED)

Professors: P. C. Caley, J. P. Crouch, D. E. Maurer, H. E. Morgan, Jr., A. F. Newton, *Head:* D. H. Pate, Jr., D. G. Tesolowski, W. E. West; *Associate Professors:* B. V. Burkett, Jr., C. H. Isbell, G. G. Lovedahl; *Assistant Professors:* D. S. Griffith, Jr., S. T. Ingram, C. D. Schmittou; *Instructor:* J. M. Leininger

101 Introduction to Industrial Education 3(2,3) Provides students a basic understanding of the underlying philosophies of industrial training and education in the public and private sectors. Students will be given the opportunity to explore the objectives and laboratory areas of each option to establish their own personal goals for a career in industrial education.

102 Woodworking I 2(1,3) Study of wood, its properties and the requisite skills necessary for understanding the use of wood in our technological way of life.

103 Woodworking II 2(1,3) Continuation of INED 102 in the study of wood, its properties, skills in machine and tool use with wood, project design, project costs and finishing processes necessary for teachers of industrial subjects. *Preq:* INED 102, 106.

105 Machining Practices 3(1,6) Basic practical shop experiences on the lathe, drill press, milling machine and shaper. Benchwork, measuring tools, theory and demonstrations related to a survey of fundamental machining practices.

106 Drafting for Industrial Education I 3(1,6) Basic drafting course which deals with sketching, orthographic projection, isometrics, sections, auxiliary views, dimensioning, developments, and intersections.

107 Drafting for Industrial Education II 3(1,6) Continuation of INED 106, dealing with drafting in specific fields such as welding, electronics, topography, and computer-aided drafting. Working

and detail drawings of machine parts including threaded fasteners, cams and gears, and techniques of inking are studied. A portion of the course is devoted to organizing materials for teaching drafting. *Preq:* INED 101, 106 or equivalent, and consent of instructor.

108 Training Programs in Industry I 3(3,0) Introduction and first-hand experience in industrial training programs. Emphasis placed on observing and participating in actual training situations as well as communications and media usage in industry. *Preq:* INED 101.

203 Basic Metal Processes 3(1,6) Material separating, forming and combining practices in the metals industries through the study of basic casting, welding and sheet metal techniques.

205 Power Technology 3(2,2) Study of power in terms of energy sources, and the generation, transmission and utilization of power. Emphasis is placed on the development of insights and understandings of the scientific and operational principles involved in the production, transmission and utilization of power. *Preq:* INED 101 or consent of instructor.

206 Advanced Drafting and Design 3(1,6) Study of the relationship of designing and engineering, the design process, stylistic periods, design, research, and product development. Various methods of technical illustration are utilized in the course. *Preq:* INED 106 or equivalent.

208 Electricity 3(2,3) Theory and application of dc and ac fundamentals, including instrumentation, power sources, circuit analysis, motors, construction wiring, and electronic principles and components. *Preq:* INED 101.

215 Technical Airbrush Illustration 3(1,6) Course dealing with the technical application of airbrush technique. Methods of depicting objects on paper, photograph retouching, sandblasting glass, and fabric decoration are all dealt with, using a single-action airbrush.

220 Recreational and Avocational Crafts 3(2,3) Provides exploratory experiences in the performance of a variety of arts and crafts activities, and encourages the development of an understanding of the purpose of arts and crafts in the comprehensive recreational program.

302 Dwelling Materials and Construction Methods 2(1,2) This course is designed as an introduction to the commonly used building materials and the methods of combining them in present day construction. *Preq:* INED 102.

310 Methods of Trade Teaching 3(3,0) Designed to give basic instruction to beginning teachers in tradework. Psychological factors of learning, individual differences, methods of teaching industrial subjects, special methods used in teaching skills, grading of students and keeping of proper records and reports. Offered in Summer Sessions only.

312 Motivation and Discipline in Vocational Education 3(3,0) Provides the classroom teacher and prospective teacher with knowledge and skills in the techniques of student discipline and motivation with application to the occupational education settings.

313 Arts and Crafts 3(1,6) Study of the art and craft of designing and making well-designed, useful objects. Emphasis on the development of skill and knowledge in the industrial crafts. Included will be laboratory activity involving work with wood, metal, ceramic, textiles, paper, plastics, and leather materials. *Preq:* INED 101.

315 (ED) Integrating Computers into the Classroom 1(0,2) See ED 315.

316 Plastics and Plastic Processes 3(2,3) Introduction to thermoplastic materials, basic processing, fabricating, and finishing operations. Related careers and technological advances will also be studied. *Preq:* INED 101.

317 Management of Industrial Education Laboratories 3(2,2) Management and operation of unit and multiple-activity laboratories, including laboratory design, selection and procurement of tools and equipment, budgeting management, and coordination of activities in laboratory courses.

320 Machine Woodworking 2(1,3) Basic characteristics of woodcutting, shaping, and finishing operations by use of machinery and auxiliary tools. Includes project work. *Preq:* Junior standing.

325 Industrial Organizations and People 3(3,0) Study of the relationship of training and safety personnel to the kinds of tasks they are asked to perform in industrial situations. Emphasis is on safety knowledge development and on techniques which may be used in industrial safety training. *Preq:* INED 101 or consent of instructor.

350 Industrial Cooperative Experience I 6(0,18) Full-time work experience program in industry. The course is offered during the summer only. Students are requested to register with the instructor one semester prior to the summer in which they plan to enroll. *Preq:* Vocational-Technical Education option only.

372 Arts and Crafts for the Elementary Child 3(2,3) Provides the elementary school teacher with an opportunity to develop skills and knowledge in the use of a variety of media suitable for integrating the study of industry and industrial technology into the usual classroom procedures.

402 Directed Teaching 12(0,36) Supervised observation and teaching in cooperation with selected public schools in which opportunities are provided for securing experience in teaching industrial subjects. *Preq:* INED 317, 425, and grade-point ratio required for graduation.

404, 604 Organization of Industrial Training Materials 3(3,0) Study of the identification, selection, and organization of subject matter appropriate for industrial training programs. Emphasis is placed on analysis techniques, session and demonstration planning, written instructional materials development, trainee evaluation, and planning instructional schedules. *Preq:* Education for Industry option, Senior standing, INED 108, and completion of a minimum of three courses selected from GC 104, INED 102, 105, 106, 203, 205, or 208.

405, 605 Course Organization and Evaluation 3(3,0) Problems, techniques and procedures in the preparation, selection and organization of subject matter for instructional purposes. Methods, techniques and preparation of materials used in the evaluation of student achievement in industrial education subjects.

407, 607 Architectural Drafting for Industrial Education 3(1,6) Study of the major aspects of architectural drawing, such as plot, floor, and foundation plans; wall sections; and elevations. *Preq:* INED 106.

408, 608 Training Programs in Industry II 3(3,0) Basic concepts of supervision, administration, and management of training programs. Emphasis on determining training requirements, planning, directing, and evaluating training programs. *Preq:* INED 108, 404.

410, 610 Special Institute Course: Topics in Industrial Education 1-3(1-3,0) Subject areas organized according to institute needs. Content of the course will be planned cooperatively by the University and the school system or agency requesting the course. *Preq:* Teacher or Graduate standing.

414, 614 Electronics for Teachers 3(1,6) Principles of electronics as applied in communications and automatic controls involving transistors, integrated circuits, and other electronic devices and materials for the preparation of teachers of industrial arts and vocational-technical electricity and electronics. *Preq:* INED 208 or equivalent.

415, 615 Construction Practices 3(2,3) Study of industrial practices affecting man, materials, and equipment employed by the construction industry. Activities are directed to developing a working knowledge of construction technology and a framework for incorporating this industry into the industrial technology curriculum of the secondary school. *Preq:* INED 101 or Graduate standing.

418, 618 Technological Concepts in Manufacturing 3(2,3) This course is designed to familiarize industrial education students with the technological concepts of management, production, and personnel practices employed in manufacturing industries. Students also will develop materials and utilize methods which will assist them in teaching concepts about manufacturing at the secondary-school level. *Preq:* INED 101 or Graduate standing.

420 Instructional Technology 3(3,0) Designed to familiarize students with the various equipment, materials, and techniques associated with the delivery of instruction. Students will design, produce, and present materials to meet specific educational objectives. *Preq:* INED 405 or one year of teaching experience.

421 Vocational Cooperative Programs 3(3,0) Study of the developments, objectives and principles of cooperative training programs. Emphasis is on the organization, promotion, and management of programs in vocational education. *Preq:* Consent of instructor.

- 422, 622 History and Philosophy of Industrial and Vocational Education 3(3,0)** Study of industrial and vocational education programs with the intent of developing a sound individual philosophy of industrial and vocational education. General topics covered: history; local, state, and federal legislation; types of vocational-technical programs; professional organizations; manpower utilization, vocational guidance, and training; industry, labor, and school relationships.
- 424, 624 School Safety 3(3,0)** Study of the principles of school safety emphasizing safety analyses, accident prevention, remediation of unsafe conditions, development and use of instructional materials, and school liability. *Preq:* Senior or Graduate standing in Education.
- 425, 625 Teaching Industrial Subjects 3(3,0)** Effective methods and techniques of teaching industrial subjects. Emphasis is given to class organization, preparation of lesson outlines, and audio-visual aids. *Preq:* ED 335.
- 432, 632 Advanced Woodworking 2(1,3)** Advanced consideration of machine methods and developments, materials, quality factors, and evaluation of instructional materials. *Preq:* INED 102.
- 433 Internship in Vocational Technical Education I 6(0,18)** Supervised observation and teaching in cooperation with selected area vocational centers, high schools, and technical colleges to provide experience in teaching specified trades and industrial subjects. *Preq:* INED 317 and consent of instructor.
- 434 Internship in Vocational Technical Education II 6(0,18)** Continuation of INED 433. *Preq:* INED 433 and consent of instructor.
- 435, 635 Advanced Industrial Metalworking Practices 3(2,3)** Continuation of INED 203, enabling advanced studies in welding, foundry, and structural metals. A portion of the course will be devoted to studying existing metals manufacturing industries and to developing and using curriculum materials for teaching metalworking concepts. Field trips will be taken. *Preq:* INED 203.
- 438, 638 Advanced Machining 3(1,6)** Advanced experiences in the set-up, operation and maintenance of machine tools and equipment. Project and product design. Study and reports of recent machining technological developments. *Preq:* INED 105.
- 441 Comprehensive Laboratory in Industrial Education 3(1,4)** Course designed to develop skill in working in and the management of multiple activity programs as carried out in the industrial arts and prevocational laboratories. Opportunity is provided to develop a management plan for multiple activities in comprehensive laboratories that the student can use during the directed teaching experience. *Preq:* INED 101 and a minimum of 4 courses selected from the following: GC 104, INED 102, 105, 203, 205, 208.
- 442, 642 Competency Testing in Vocational Subjects 3(3,0)** Study of competency testing in vocational education which includes educational objectives and measurement; construction and use of oral, objective, short answer, matching, essay, and performance tests; and treatment of test data for grade assignments and statistical analysis.
- 443, 643 Vocational Special Needs Education 3(3,0)** Theory and practice related to serving special needs populations in vocational education including legislation, classification systems, school and community relations, career clusters and job analyses, IEPs with a vocational focus, assessment, work adjustment, and development and modification of curricula and instruction. *Preq:* Senior standing.
- 450 Industrial Cooperative Experience II 6(0,18)** Continuation of INED 350. Summer only. *Preq:* Vocational/Technical option only.
- 451 Special Projects 3(3,0)** The student is assigned a project in accordance with his needs and capabilities. Projects are either experimental, theoretical or developmental and cover subjects not thoroughly covered in other courses. *Preq:* Consent of Instructor.
- 452, 652 Advanced Projects 1-6** The student gains depth in content by completing a project under the supervision of an instructor in one of the following subject areas: Arts and Crafts, Drawing and Design, Electricity and Electronics, Graphic Arts, Metalworking, Occupational Education, Power, and Woodworking. *Preq:* Consent of instructor.

460, 660 Career Education 3(3,0) Introduction to the concepts and philosophical basis for career education with emphasis on the applications of career education as an integrating force within the total school curriculum. This course is designed for all students preparing to teach or those seeking to improve their teaching competencies. *Preq:* AGED 201, ED 100, INED 101, or Graduate standing.

464, 664 Still Media Production 3(1,4) Provides the student with the opportunity to apply still-picture media techniques to tasks in both education and industry.

465, 665 Instructional Video Production 3(1,4) Designed to acquaint the student with basic video tape production techniques, which include planning, scripting, taping, and editing. Emphasizes the development of individual skills, and deals with the production of instructional tapes as opposed to "artistic" ones.

468, 668 Advanced Power Technology—Fluid 3(2,2) Continuation of INED 205 with emphasis on transmission and control of power by means of hydraulics and pneumatics. Provides teachers with classroom opportunities to learn fundamental theory and applications of fluid power and gives hydraulic and pneumatic mechanisms used extensively in the manufacturing, construction, and transportation areas of industrial education. *Preq:* INED 205 or consent of instructor.

470, 670 Internal Combustion Engines 3(2,3) Involves study of the internal combustion engine: theory of operation, applications, methods of analyzing performance, and troubleshooting malfunctions. The course is intended as an elective for Industrial Arts and Vocational-Technical option majors who desire proficiency in this essential area of Industrial Education. *Preq:* INED 205 or consent of instructor.

480, 680 (AGED, COLED, ED) Educational Applications of Microcomputers 3(3,0) See COLED 480.

482, 682 (AGED, COLED, ED) Advanced Educational Applications of Microcomputers 3(2,2) See COLED 482.

496, H496, 696 Public Relations 3(3,0) This course emphasizes the techniques and methods of effective public and industrial relations which contribute to understanding and cooperation of labor, business, professional, educational, and industrial groups.

700 (ED) Supervising the Student Teacher in the Public Schools 2-3(2-3,0)

815 Seminar in Industrial Education 1(1,0)

820 Recent Process Developments 3(3,0)

830 Concepts of Human Resources Development 3(3,0)

840 School Shop Design 3(3,0)

845 Needs Assessment for Education/Industry 3(3,0)

846 Applied Public Relations 3(3,0)

847 Instructional Systems Design 3(3,0)

849 Evaluation of Training and Development/HRD Programs 3(3,0)

860 Instructional Materials Development 3(3,0)

861 Administration and Supervision of Vocational Education 3(3,0)

865 American Industries 3(3,0)

870 Consulting for Education and Industry 3(3,0)

889 (AGED, ED) Research in Education 3(3,0)

894 Project Research 1-6(1-6,0)

895 Special Problems I 3(3,0)

896 Special Problems II 3(3,0)

INDUSTRIAL ENGINEERING (IE)

Professors: J. A. Chisman, R. P. Davis, *Head*; W. J. Kennedy, Jr., C. R. Lindenmeyer; *Associate Professors:* J. S. Greenstein, D. L. Kimbler; *Assistant Professors:* W. G. Ferrell, Jr., B. A. Watford; *Instructor:* S. C. Clark

301 Work Methods and Measurement I 3(2,3) Methods engineering and work measurement for cost control and reduction, planning, and scheduling. Graphic system representation techniques, time

study, work sampling, standard data development, and predetermined basic motion time data systems are introduced. *Coreq:* MTHSC 301 or consent of instructor.

306 Manufacturing Processes 3(2,3) The basic structure of modern manufacturing processes and material properties related to manufacturability, with emphasis on metal cutting, metal working, molding, joining, and finishing. Laboratory experience in machine tool operation. *Preq:* Consent of instructor.

350 Modeling and Analysis for Industrial Engineers 3(3,0) Model development and problem-solving techniques in applied mathematics from an industrial engineering perspective. *Preq:* MTHSC 206 or consent of instructor.

361 Industrial Quality Control 3(3,0) Comprehensive survey of techniques from applied statistics and probability which are most applicable to modeling and problem solving in industry. Topics include probability and statistical theory review, statistical quality control charts, acceptance sampling, curve fitting, forecasting, and reliability analysis. *Preq:* MTHSC 405 or consent of instructor.

364 Design and Measurement of Work 3(3,0) Work design principles and techniques for improving productivity. Techniques for work measurement including time study, predetermined times, and work sampling. Demonstrations and case problems are used to illustrate and practice applications. Not for engineering majors. *Preq:* MGT 299 and 399 or equivalent.

384 Engineering Economic Analysis 3(3,0) Basic principles and techniques of economic analysis of engineering projects. Consideration of time value of money, short- and long-term investments, replacement analysis, depreciation methods, cost allocation and measures of cost effectiveness.

401, 601 Work Methods and Measurement II 3(2,3) Predetermined basic motion-time data analysis of work; methods for synthesis of effective work methods and standards development. Methods-Time Measurement (MTM) is presented in detail to permit application proficiency. Standard data development, using a variety of techniques is covered with emphasis on the use of stepwise multiple regression analysis. A field project is required. *Preq:* IE 301 and MTHSC 405 or consent of instructor.

452, 652 Reliability Engineering 3(3,0) Probabilistic approach to assessing system reliability. Methods for analyzing serial, parallel, and complex systems include decomposition and cut-set analysis. Reliability life testing and its acceleration are covered. Essential elements of maintainability are identified and related to system availability. *Preq:* Multivariate Calculus and Introductory Statistics or consent of instructor.

461, 661 Quality Engineering 3(3,0) Design aspects of quality and the engineer's role in problems of quality in production systems. *Preq:* IE 361.

465, H465, 665 Facilities Planning and Design 4(3,3) Study of the principles and techniques of plant layout. Economic selection of materials handling equipment and integration of this equipment into the layout plan to provide effective product flow. Quantitative techniques for evaluation of facilities plans. A field project is required. *Preq:* IE 301 and 482, or consent of instructor.

466, 666 Production Systems Engineering 3(2,3) Study of methods for manufacturing operations measurement, analysis, and design. Organizational concepts, techniques for work-methods analysis and measurement, human factors, statistical quality control, and graphical techniques for facility arrangement. Not to be taken by undergraduate Industrial Engineering majors. *Preq:* MTHSC 400 or consent of instructor.

473, 673 Microcomputer Applications in Industrial Engineering 3(2,3) Introduction to microcomputer-processor fundamentals, software and hardware as these relate to process control, robotics, and computer-integrated manufacturing. Applications demonstrated by laboratory projects. *Preq:* ECE 307 and 309, computer programming ability or consent of instructor.

474, 674 Advanced Manufacturing Systems 3(2,3) Study of state-of-the-art automated manufacturing systems, CAD/CAM, computer-integrated manufacturing, advanced 3-D computer controlled machining systems, adaptive control, group technology, and flexible manufacturing systems. *Preq:* IE 306. *Coreq:* IE 473 or consent of instructor.

475, 675 Manufacturing Control Systems 3(2,3) Advanced study of manufacturing process control by microcomputers and programmable logic controllers; sensors and transducers; discrete and continuous open and closed loop control applications, data acquisition, communication protocols, and networking. *Preq:* IE 473 or consent of instructor.

480, 680 Methods of Operations Research I 3(3,0) Introduction to the most useful linear operations research models, including linear programming, integer linear programming, transshipment and assignment problems and network flows. *Preq:* IE 350 or consent of instructor.

481, 681 Methods of Operations Research II 3(3,0) Probabilistic and random process modeling of industrial systems. Topics include Markov chains, continuous time Markov processes, and queueing theory. *Preq:* IE 350 or consent of instructor.

482, 682 Systems Modeling 3(3,0) Modeling of discrete and continuous industrial systems using a digital computer. The purpose, theory, and techniques of systems modeling are presented. *Preq:* MTHSC 400 or consent of instructor.

483, 683 Case Studies in Industrial Engineering 3(3,0) Actual industrial case studies will be used to strengthen the student's ability to identify problems, to select a solution procedure, and to recommend an action. *Preq:* Senior standing in Industrial Engineering.

485, 685 Industrial Systems Engineering 3(3,0) Modeling and analysis of multistage decision processes, recursive optimization, process and system design and control problems. *Preq:* IE 480 and 481 or consent of instructor.

486, H486, 686 Production Planning and Control 3(3,0) Fundamentals underlying the determination of production capacity requirements, economic lot sizes, and the regulation of flow and storage of materials to, within, and from the production system. Elements of forecasting, determination of materials requirements, scheduling, inventory control, etc. Consideration of data processing methods. *Preq:* IE 481 or consent of instructor.

488, 688 Human Factors Engineering 3(2,3) Human factors engineering as a systems design method. Industrial application of human factors data to recognize and/or measure behavioral and physical limitations, investigate deficiencies, and improve these systems based on safety, health, and worker satisfaction. *Preq:* MTHSC 301 or equivalent or consent of instructor.

489, 689 Industrial Ergonomics 3(2,3) Presentation of the theory and practice of ergonomic principles in the industrial setting. Emphasis is placed on the classic ergonomic problems of work place and work space design, manual materials handling, physically demanding jobs, environmental factors, and human error. Emerging areas such as design for disabled workers are addressed. *Preq:* IE 488 or consent of instructor.

491, H491 Selected Topics in Industrial Engineering 1-3(0-3,0-9) Comprehensive study of any timely or special topic in industrial engineering not included in other courses. May be repeated for a maximum of 6 credits. *Preq:* Consent of instructor.

492 Design Topics in Industrial Engineering 1-3(0-3,3-9) Comprehensive study of any timely or special design topic in industrial engineering. May be repeated for a total of 6 credit hours. *Preq:* Consent of instructor.

703 Engineering Project Operations 3(3,0)

801 Analysis, Modeling, and Design of Human-Machine Systems 3(3,0)

802 Design of Human-Computer Systems 3(3,0)

803 Engineering Optimization and Applications 3(3,0)

807 Discrete Systems Simulation 3(3,0)

808 Continuous Systems Simulation 3(3,0)

860 Dynamic Programming 3(3,0)

861 Nonlinear Programming and Methods of Search 3(3,0)

865 Facility Planning and Material Handling 3(3,0)

871 Industrial Testing and Quality 3(3,0)

873 Computer-Aided Manufacturing 3(2,3)

880 Advanced Methods of Operations Research 3(3,0)

884 Advanced Engineering Economic Analysis 3(3,0)

885 Design and Analysis of Simulation Models 3(3,0)

886 Operations Research in Production Control 3(3,0)

888 Applied Queuing Theory and Markov Processes 3(3,0)

890 Special Problems in Industrial Engineering 1-3(1-3,0)

891 Master's Research. Credit to be arranged.

893 Selected Topics in Industrial Engineering 1-3(1-3,0)

895 Industrial Engineering Seminar 1(1,0)

907 Production Systems Simulation 3(2,3)

991 Doctoral Research. Credit to be arranged.

INTEGRATED PEST MANAGEMENT (IPM)

Professor: J. A. Brittain

401, 601 Principles of Integrated Pest Management 3(2,3) Origins, theory, and practice of integrated pest management. Relationships among crop production and protection practices are explored. Economics of various control strategies are considered. Integrated pest management field projects are studied. Conventional and integrated pest management approaches are compared. Multidisciplinary plant problem analysis is introduced. *Preq: AGRON 407, ENT 301, PLPA 301, or consent of instructor.*

700 Internship in Plant Health 1-5(0,8-40)

704 Seminar 1(1,0)

INTERNATIONAL STUDIES (IS)

201 Global Perspectives 3(3,0) Systematic and topical survey of global issues—population, food, energy, and defense—and contemporary international problems, designed to develop awareness of the interrelatedness of global concerns and everyday life.

ITALIAN (ITAL)

Professor: M. Cranston; Associate Professor: L. T. Perry

101, H101 Elementary Italian 4(3,1) Introductory course stressing grammar, pronunciation, oral practice, and reading skills. Attention is given to practical everyday living as well as cultural considerations.

102, H102 Elementary Italian 4(3,1) Continuation of ITAL 101. *Preq: ITAL 101 or consent of instructor.*

196 Practicum in Italian 1(0,1) On-campus program of teaching foreign languages to children. Students work under the supervision of faculty in planning and teaching one 45-minute class per week to children in grades 1-8. May be repeated for a total of 3 credits. *Preq: Third year language standing or consent of department head.*

201, H201 Intermediate Italian 3(3,0) Brief review of ITAL 101 and 102, with conversation, composition, and dictation, and the beginning of more serious reading of Italian literature in short stories and plays. *Preq: ITAL 102.*

202, H202 Intermediate Italian 3(3,0) Increasingly difficult readings in Italian literature, supplemented with classroom discussions and compositions. *Preq: ITAL 201.*

398 Directed Reading 1-3(1-3,0) Directed study of selected topics in Italian literature, language, and culture. May be repeated for a maximum of 6 credits. *Preq: Consent of department head.*

JAPANESE (JAPN)

Visiting Instructor: T. Kishimoto

101 Elementary Japanese 4(3,1) Course for beginners in which the fundamentals of the language are taught and a foundation is provided for further study and the eventual ability to read and speak the language. The Japanese writing system will be introduced. Students will learn how to recognize and write the two alphabets HIRAGANA and KATAGANA. Three hours a week of classroom instruction and one hour a week in the language laboratory.

102 Elementary Japanese 4(3,1) Continuation of JAPN 101. Three hours a week of classroom instruction and one hour a week in the language laboratory. *Preq: JAPN 101.*

201 Intermediate Japanese 3(3,0) A brief review of JAPN 101 and 102, with conversation, composition and beginning of more serious reading of Japanese in short stories. Students study Kanji characters. *Preq: JAPN 102.*

202 Intermediate Japanese 3(3,0) A brief review of JAPN 201, with conversation, composition, and dictation based on more difficult Japanese reading selections; includes a continuation of Kanji characters. *Preq:* JAPN 201.

LANGUAGE AND INTERNATIONAL TRADE (L&IT)

400 Language and International Trade Internship 3(0,40) A one-semester, full-time (or equivalent part-time) work assignment which provides the opportunity for the student to extend theoretical classroom learning through work experience in an appropriate setting. A final report is required. May be repeated for a total of 6 credits. May be taken pass/fail only. *Preq:* FR 316, GER 316, or SPAN 316 and 12 semester hours in a Language and International Trade technical option.

LATIN (LAT)

Professor: R. R. McGregor, Jr.

101 Elementary Latin 4(4,0) Course for beginners designed principally to teach the reading of the language.

102 Elementary Latin 4(4,0) Continuation of LAT 101.

201 Intermediate Latin 3(3,0) Review of the fundamental principles of grammar in conjunction with readings from the Classical period. *Preq:* LAT 102 or equivalent.

202 Intermediate Latin 3(3,0) Continuation of LAT 201 with the introduction of writings from the late Latin and Medieval periods. *Preq:* LAT 201 or equivalent.

398 Directed Reading 1-3(1-3,0) Directed study of selected works in Latin. May be repeated for a total of six semester credits. *Preq:* LAT 202 or equivalent and consent of department head.

LAW (LAW)

Professors: R. E. Meiners, R. J. Staaf; *Associate Professor:* E. C. Hipp, Jr; *Lecturer:* T. M. Patrick, Jr.

312 Commercial Law 3(3,0) Introduction to business law with primary attention given to contracts, agency, and negotiable instruments. *Preq:* Junior standing.

313 Commercial Law 3(3,0) Continuation of LAW 312 with emphasis on business organization, personal and real property, estates and bankruptcy, sales and secured transactions. *Preq:* LAW 312 or consent of instructor.

322 Legal Environment of Business 3(3,0) Development of both state and national regulation of business. Attention is given to the constitutional force and limitations of power, specific areas in which governments have acted, and the regulations that have been imposed in these areas. *Preq:* Junior standing.

333 Real Estate Law 3(3,0) The nature of real property and means of acquiring rights therein: conveyance of ownership, creation and execution of deeds, mortgages, etc., landlord and tenant relationships, shared ownership concepts, and government regulation.

401 Labor Law 3(3,0) Basic labor law in the National Labor Relations Act, the Taft-Hartley and Landrum-Griffin Acts. Legal problems raised by state and federal statutes such as Workmen's Compensation, Wage and Hour Legislation, and Equal Opportunity laws. *Preq:* LAW 322, Junior standing.

402 Law and Economics 3(3,0) Application of economics to the law of property, torts, and contracts; regulation of markets, business organizations and financial transactions; and the distribution of income and wealth. *Preq:* ECON 211 and LAW 312 or consent of instructor.

LEISURE SKILLS (LS)

Professor: G. E. Howard; *Associate Professors:* J. R. Pope, Jr., C. R. White, Jr.; *Assistant Professor:* M. H. Wynn; *Visiting Instructor:* D. A. Dowd

101 Challenge Recreation Activities 1(1,0) Course designed to encourage students to broaden their leisure skills and improve their self-images through challenge activities. Classroom instruction will stress how to get started safely in flying, scuba, canoeing, skiing, sailboarding, mountaineering, hang-gliding, ballooning, and other challenge activities.

110 Bowling 1(0,3) Basic instructional program on techniques of bowling.

130 Alpine Skiing 1(0,45) Basic downhill snow skiing instruction including equipment selection, safety, and maintenance; parallel turns; edging; carved and linked turns; wedeling; and safety and etiquette. There is an additional fee for this course. Taught during Christmas recess. (Contact the Department of Parks, Recreation, and Tourism Management in October.)

140 Fencing 1(0,3) Individual and group instruction for beginners in the basic skills and techniques of foil fencing.

150 Beginning Swimming 1(0,3) Fundamentals of swimming and water safety.

151 Aquatic Sports and Diving 1(0,3) This course is designed to acquaint the student with various forms of aquatic sports; competitive swimming, diving and water polo.

152 Sailing 1(0,3) Basic instruction in the nomenclature, safety and rescue techniques, and skills required to skipper sailing craft. *Preq:* Basic swimming skills.

153 Beginning Canoeing 1(0,3) Basic instruction in the nomenclature, strokes, and safety techniques in canoeing. *Preq:* Basic swimming skills.

154 Windsurfing 1(0,3) Basic board sailing instruction including rigging, launching, tacking, jibbing, rig and foot steering, safety, maintenance, equipment selection, rules-of-the-road, and racing techniques are covered. Offered Fall Break and First Summer Session. There is an extra fee for this course. *Preq:* Ability to swim 300 yards and tread water for 5 minutes.

160 Beginning Tennis 1(0,3) Fundamentals course stressing rules, basic strokes and strategy, with ample opportunity for practice.

162 Handball 1(0,3) Thorough knowledge and understanding of the rules, strategy, fundamental skills, and techniques of handball for the beginning player.

163 Racquetball 1(0,3) Basic skills, knowledge of rules, and strategy, and basic strokes.

170 Beginning Golf 1(0,3) Fundamental course stressing rules, strategy, and basic strokes.

190 Modern Dance 1(0,3) Introduction to modern dance techniques with emphasis on developing the style of movement and understanding the dance art form.

230 Advanced Alpine Skiing 1(0,45) Advanced downhill snow skiing instruction in such techniques as mogul skiing, check turns, free-style, and racing. There is an additional fee for this course. Taught during Christmas recess. (Contact the Department of Parks, Recreation, and Tourism Management in October.) *Preq:* LS 130 or consent of instructor.

254 Advanced Lifesaving 1(0,3) Course designed to enhance aquatic skills and to develop lifesaving techniques. It teaches progressive techniques and practice of lifesaving and water safety skills. *Preq:* Pass preliminary swim test.

255 Water Safety Instruction 1(1,0) Course teaches progressive techniques and practice of teaching swimming and lifesaving. *Preq:* LS 254.

260 Intermediate-Advanced Tennis 1(0,3) Opportunity to advance and correct mistakes in basic tennis skills. *Preq:* Basic tennis skills.

263 Intermediate Racquetball 1(0,3) Course stressing advanced skills, techniques, and strategy with ample opportunity for practice and competition. Conditioning drills and safety aspects will also be covered. *Preq:* LS 163 or consent of instructor.

LIBERAL ARTS (LA)

110, H110 Honors Seminar in the Humanities 3(3,0) Designed to enhance and enrich the offerings in the junior division honors program of the University by providing students with intellectually invigorating and challenging interdisciplinary seminars. Variable topics. May be repeated once for credit.

H111 Seminar in the Social Sciences 3(3,0) Topical Seminar designed to enhance and enrich the offerings of the University by providing students with intellectually invigorating and challenging interdisciplinary seminars. May be repeated once for credit.

MANAGEMENT (MGT)

Professors: E. E. Burch, Jr., J. K. Butler, Jr., M. D. Crino, W. H. Hendrix, J. J. Kanet, R. L. LaForge, T. L. Leap, W. W. Menke, M. J. Stahl, *Head:* T. W. Zimmerer; *Associate Professors:* R. S. Cantrell, D. W. Grigsby, M. A. McKnew, J. W. Patterson, D. M. Swanson;

Assistant Professors: R. T. Barrett, R. L. Clark, J. S. Davis, E. H. Hall, Jr., J. S. Harrison, J. D. Holmes, E. W. Miles, C. H. St. John, H. Soroush, V. Sridharan, T. P. Summers; *Instructors:* C. S. Ellis, A. D. Wheeler; *Lecturer:* J. H. Abraham; *Visiting Instructors:* H. P. Coston, M. J. Pinson, M. Soroush

105 Current Topics in Industrial Safety Management 1(1,0) Discussion of current events related to safety and health and the rights and responsibilities of employees, employers, and the public. Topics will include right-to-know legislation, product liability, risk and insurance, nuclear power, drug use in the workplace and other recent issues.

200 Introduction to Business 3(3,0) The role of business in our society will be critically examined. The student will be exposed to a broad overview of the functions of a business. Enrollment for credit not allowed for students majoring in Accounting, Management, Financial Management, or Industrial Management.

299 Computer Utilization 1(1,0) Familiarization in the use of modern timesharing computer terminals and minicomputers. *Preq:* CPSC 120 or equivalent.

301, H301 Principles of Management 3(3,0) Management's role as a factor of economic production. Functions of management, principles of organization, and behavior in organizations.

302 Principles of Industrial Safety Management 3(3,0) Fundamentals of industrial safety management, including loss prevention, industrial hygiene, and fire protection. This course serves as a good single course overview of the field and also is an excellent introduction to further courses in this area.

307, H307 Personnel Management 3(3,0) Principles, concepts, and techniques concerned with effective and efficient utilization of personnel. Emphasis on motivation, leadership, and human behavior as they relate to employer-employee relations. Topics include personnel recruitment, classification, selection, training, development, and performance evaluation. *Preq:* Junior standing.

308 Fundamentals of Industrial Hygiene 3(3,0) Study of effects of chemical, biological, physical, and ergonomic workplace hazards on human health. Included are fundamental concepts of toxicology, industrial hygiene, and risk assessment, as well as discussions of regulatory issues and current case studies.

320 Accident Prevention and Loss Control 3(3,0) Philosophies and techniques of accident prevention and loss control, including risk assessment, hazard analysis, accident investigation, and methods to control and correct loss-producing conditions; also application of these techniques to current technologies.

322 Industrial Hazard Recognition and Control 3(3,0) Application of basic physical principles to the understanding, recognition, and control of mechanical, electrical, thermal, and nuclear hazards in the industrial setting.

399, H399 Management Applications of Microcomputers 2(1,3) Three aspects of microcomputer applications are addressed: (1) analysis of the business potential of microcomputer applications, (2) use of microcomputers to reinforce material from other management courses, and (3) the microcomputer as a personal/professional support device. *Preq:* ACCT 201, MTHSC 301 or consent of instructor.

400 Management of Organizational Behavior 3(3,0) Purpose of this course is to provide the management student with a framework for understanding how behavior within business organizations is managed. Particular emphasis will be placed on integrating management theory with recent developments in the behavioral sciences with distinct management applications. Theory, research, and business applications will be considered. *Preq:* MGT 301 or 307.

401 Fire Protection and Prevention 3(3,0) Fundamental course to increase awareness of the causes of uncontrolled fires and explosions. The associated dangers to life, property, and industrial/commercial productivity are stressed, along with techniques available for their protection (education, detection, suppression).

402, H402, 602 Production and Operations Management I 3(3,0) Managing, planning, and controlling production and service operations with emphasis on demand forecasting, aggregate planning, production scheduling and inventory management. *Preq:* MTHSC 301 or equivalent.

403 Special Problems 1-3(1-3,0) Planning, developing, and executing a research project related to the field of management or defense studies. *Preq:* Senior standing in Industrial Management or Management and consent of instructor.

404 Advanced Statistical Quality Control 3(3,0) Statistical control techniques as applied to all areas of quality control: process control, process capability, acceptance sampling, and economic aspects of quality decisions. Cannot be taken for credit by students required to take MGT 304. *Preq:* MGT 402 and MTHSC 301.

405, 605 Economics of Transportation 3(3,0) Topics covered include history and structure of transportation systems in the United States, the nature of transportation costs and rates, transportation systems as factors in industrial location, government policy toward transportation, and transportation and national security. *Preq:* Senior standing or consent of instructor.

406, 606 Location Economics 3(3,0) Theoretical study of the general factors which determine industrial location in a market place economy. Current literature is surveyed. A comparison of location theory and actual location patterns is stressed. *Preq:* Senior standing or consent of instructor.

407 Directed Research 1(1,0) Planning, developing, and executing a research project related to the field of management. *Preq:* Senior standing in Management or Industrial Management.

408, 608 Production and Operations Management II 3(3,0) Managing, planning, and controlling production and service operations with emphasis on design of production systems, work measurement and standards, maintaining effective operations, project management and quality control. *Preq:* MGT 402.

409, 609 (ECON) Managerial Economics 3(3,0) See ECON 409.

410 Safety in Building Construction 3(3,0) Fundamentals of accident prevention and the Occupational Safety and Health Act as applied to the construction industry. Management-oriented program that establishes safety as a cornerstone of profitability and efficiency in a complex industry.

415, H415, 615 Business Strategy 3(3,0) Capstone course for seniors. Various methods are used in analyzing complex business problems, requiring students to integrate their knowledge of all areas of business. Student participation and written and oral communications are stressed. *Preq:* ACCT 202; ECON 211, 212; FIN 306 or 312; MGT 301; MKT 301 and Senior standing.

416, 616 Management of Human Resources 3(3,0) Recent developments in the management of human resources with emphasis on results of research into the motivation, development of potential, and full utilization of the human resources. *Preq:* MGT 307 or consent of instructor.

417, 617 Logistics Management 3(3,0) Management of physical distribution and supply systems with emphasis on design concepts, cost determinants and control. *Preq:* Senior standing or consent of instructor.

418, 618 Management Information Systems 3(3,0) Use of data processing concepts as an aid in implementing managerial functions. Electronic data processing terminology, software, hardware, computer operations and techniques, systems analysis and the principles of management information systems design and implementation are emphasized. *Preq:* CPSC 120 or equivalent.

419 Industry and the Environment 3(3,0) Discussion of current issues and policies involving the impact of industry on the environment and effects of current environmental regulations and attitudes on industrial operations. Included are topics in environmental management, pollution and control, hazardous waste, and environmental liability.

420, 620 Defense Management 3(3,0) Examines components and budget classifications as well as organization and management systems employed in the Department of Defense. *Preq:* ECON 419 or consent of instructor.

422 Small Business Management 3(3,0) Study of the management of the small independently owned and operated business. Emphasis will be placed upon analyzing new business opportunities, planning and establishing a going concern, and managing the contemporary small business. Field experience in consulting with small businesses will enhance the student's understanding of the unique opportunities and problems of small business organizations. *Preq:* ACCT 201, MGT 301, MKT 301.

423, 623 International Business Management 3(3,0) Survey of the theoretical and institutional complexities of international business operations. Topics include exporting, importing, foreign investment, multinational corporations, and the international payment system. *Preq:* Senior standing.

424, 624 International Transportation and Logistics 3(3,0) Examination and analysis of international transportation systems and their logistics support systems. Topics include ocean shipping, international air transportation, port management and EEC and Soviet-block transport systems. International transport legislation and policies are also analyzed. *Preq:* Senior standing or consent of instructor.

425, 625 Compensation Management 3(3,0) Examination of the compensation employees seek in exchange for their efforts and contributions. Topics include government and union influences; job content analysis, description, and evaluation; developing pay structures; measuring and paying for performance; employee benefits; administration of the compensation plan; executive, managerial, professional, and sales. *Preq:* MGT 307.

430 Senior Seminar in Management 3(3,0) Involves an indepth study of current business topics and allows the senior management student the opportunity to relate their academic studies to real-world problems. A senior paper will be required. *Preq:* Senior standing.

800 Management Gaming 1(0,3)

801 Production and Pricing Analysis 3(3,0)

802 Finance 3(3,0)

803 Operations Management 3(3,0)

804 Managerial Policy 3(3,0)

805 Advanced Quality Control 3(3,0)

807 Comparative Management Theory 3(3,0)

810 Management and the Law 3(3,0)

811 Advanced Marketing Analysis 3(3,0)

812 Transportation Planning and Policy 3(3,0)

813 Business Research 3(3,0)

815 Personnel Management 3(3,0)

816 Management of Human Resources 3(3,0)

817 Information Systems Design and Implementation 3(3,0)

818 Management Support Systems 3(3,0)

891 Master's Research. Credit to be arranged.

903 Research Issues in Material Requirements Planning 3(3,0)

904 Seminar in Current Management Topics 3(3,0)

905 Research Methods 3(3,0)

910 Seminar in Operations Management 1-3(1-3,0)

911 Seminar in Decision Theory 1-3(1-3,0)

912 Seminar in Financial Analysis 3(3,0)

913 Management Systems Analysis 3(3,0)

914 Seminar in Marketing Management 3(3,0)

915 Seminar in Business-Level Strategy 3(3,0)

916 Directed Readings in Management 1-3(1-3,0)

918 Seminar in Management Support Systems 3(3,0)

921 Seminar in the Science and Practice of Business and Economic Modeling 3(3,0)

950 Seminar in Corporate-Level Strategy 3(3,0)

952 Seminar in Strategy Implementation 3(3,0)

991 Doctoral Research. Credit to be arranged.

MANAGEMENT SCIENCE (MASC)

Professor: E. E. Burch; *Associate Professors:* R. S. Cantrell, M. A. McKnew, J. W. Patterson, D. M. Swanson; *Assistant Professor:* R. T. Barrett; *Instructor:* C. S. Ellis

310, H310 Introduction to Management Science 3(3,0) Quantitative methods of the management scientist with applications to business and industrial problems. Topics include regression analysis, correlation analysis, analysis of variance, sampling, and nonparametric methods. *Preq:* MTHSC 301.

311, 611 (ECON) Introduction to Econometrics 3(3,0) See ECON 311.

312, H312 Decision Models for Management 3(3,0) Exploration of the ways in which management science decision models can help in making sound managerial decisions. Topics include decision models and decision making, deterministic modeling, probabilistic modeling, and simulation. *Preq:* CPSC 120, MTHSC 301.

413 Management Science I 3(3,0) Role and use of management science techniques in decision making in business and industry. Stochastic and deterministic models will be emphasized. Topics include linear programming, queuing, Markov chains, and simulation. *Preq:* Consent of instructor.

414 Statistical Analysis 3(3,0) Application of statistics in management decision making. Emphasis is placed on the proper design, analysis and interpretation of planned experiments. Topics include single factor through fractional factorial experiments. *Preq:* MTHSC 301 or equivalent.

806 Regional Science Methods 3(3,0)

807 (ECON) Econometric Methods I 3(3,0)

808 (ECON) Econometric Methods II 3(3,0)

810 Foundations of Management Science 3(3,0)

812 Management Science II 3(3,0)

814 Design of Experiments in Business and Management 3(3,0)

MARKETING (MKT)

Professors: R. M. Reese, G. R. Thompson, *Interim Head;* G. L. Waddle; *Associate Professors:* S. J. Grove, E. C. Hipp, Jr., M. C. LaForge; *Assistant Professors:* W. F. Forrester, Jr., R. Gomes, P. W. Hermann, J. J. McClung, J. A. Muncy

127 Introduction to Global Marketing 1(1,0) Survey of the nature of global marketing and related career opportunities. Information and applications of specific relevance to the marketing of the tourism, agriculture, and textile industries will be offered. To receive credit, this course must be completed before MKT 427. Graded Pass/Fail only.

301 Principles of Marketing 3(3,0) Principles and concepts involved in planning, pricing, promoting and distributing of goods and services.

402, 602 Consumer Behavior 3(3,0) Examination of selected behavioral science concepts and their application to the understanding of consumer decision making. Text and cases. *Preq:* MKT 301.

422, 622 Marketing for Small Business 3(3,0) Translation of the theories of marketing into practical ideas and techniques that promote successful marketing practices in small business. *Preq:* MKT 301.

423, 623 Marketing Communications 3(3,0) Analysis of mass and interpersonal communications in marketing. Attention is given to communications theory, advertising, sales promotion, and personal selling. *Preq:* MKT 301.

424, 624 Sales Management 3(3,0) This course examines the major decisions involved in developing and managing personal selling resources. *Preq:* MKT 301.

425, 625 Retail Management 3(3,0) Retailing is studied from a decision-making approach. Topics covered include target market analysis, location analysis, merchandising, human resources, pricing, and promotion. *Preq:* MKT 301.

426, 626 Industrial Marketing 3(3,0) Study and analysis of the problems and approaches to the marketing of goods and services to commercial enterprises, governments, and nonprofit organizations. Emphasis is placed upon developing strategic responses to market opportunities given competitive behavior. *Preq:* MKT 301.

427, 627 International Marketing 3(3,0) Study of marketing from the international point of view. Emphasis will be placed upon the necessary modification of marketing thinking and practice for foreign markets due to individual environmental differences. *Preq:* MKT 301.

431, 631 Marketing Research 3(3,0) Planning, collection, processing, and utilization of information used in marketing decision making. *Preq:* MKT 301.

432, 632 Quantitative Marketing Analysis 3(3,0) Quantitative techniques applied to the investigation and solution of marketing problems. Emphasis is placed on the use of decision theory, game theory, Markov chain models, sales forecasting models, sample survey design, mathematical programming, simulation models, and marketing information systems. *Preq:* MKT 301, MTHSC 203 or 301.

437, 637 Global Marketing Strategies 3(3,0) Investigation of the importance of marketing strategy planning for the global marketer. Relevant and complex factors which vary in different global environments will be identified and analyzed. *Preq:* MKT 427.

450, 650 Marketing Management 3(3,0) Application of marketing principles in the investigation and solution of marketing problems. Managerial decision areas include products development, pricing, advertising personal selling, and channels of distribution. *Preq:* MKT 301 and 6 hours of 400-level marketing courses.

495, 695 Seminar in Marketing 3(3,0) Indepth examination of timely topics in marketing. May be repeated for credit as topics vary. *Preq:* Consent of instructor.

MATERIALS ENGINEERING (MATE)

Professors: C. C. Fain, J. G. Goree, H. J. Rack, G. C. Robinson, J. S. Wolf; *Assistant Professors:* M. Grujicic, J. M. Kennedy, E. C. Skaar

304 Metallographic Analysis 3(1,6) Laboratory exercises will acquaint the student with typical industrial and research metallographic techniques involving specimen preparation and scientific photography. Standard and specialized laboratory equipment will be introduced and used with emphasis on relating metallographic observations to material properties.

405, 605 Physical Metallurgy 3(3,0) Comprehensive treatment of electron theory, lattice defects, diffusion, solutions and phase equilibria, phase transformations, creep and fracture applied to metals and simple alloys, with emphasis on structure-property relationships. *Preq:* CRE 310.

420, 620 Introduction to Mechanical Metallurgy 3(3,0) Introduction to the elastic and plastic response of metals to pressure. Topics include the mechanisms and consequences involving ductility, brittleness, crystallography, fatigue, and creep. *Preq:* CRE 310 or equivalent.

422, 622 Introduction to Chemical Metallurgy 3(3,0) Application of structural and physical chemistry concepts to metallurgical systems. Emphasis is placed upon problem solving by both numerical and graphical methods. Major topics include bonding, intermetallic compounds, solid solutions, and heterogeneous equilibria. *Preq:* CRE 310 or equivalent; CH 331.

424, 624 Introduction to Extractive Metallurgy 3(3,0) Introduction to the economics, techniques, and theory of extracting metals from their ores. Emphasis is placed upon the chemistry and mechanics of extraction through problems involving efficiencies and yields of various metallurgical processes. *Preq:* CRE 310 or equivalent. *Coreq:* CH 331.

450, 650 Special Topics in Materials Engineering 1-4(0-4,12-0) Comprehensive study of a topic of current interest in the field of materials engineering. May be taken for credit more than one time. *Preq:* Consent of instructor.

461, 661 Nonferrous Metallurgy 3(3,0) Addresses the nonferrous metals of major structural and industrial importance including aluminum, copper, nickel, and titanium-base alloys. The industrial operations of extraction, alloying and thermomechanical processing are related first to the resultant microstructures and subsequently to the engineering properties and applications of these alloys. *Preq:* CRE 310 or equivalent training.

462, 662 Ferrous Metallurgy 3(2,3) Emphasizes the industrial processing of cast irons, carbon steels and specialty steels with special regard to their response to heat treatment. The relationship between microstructure and mechanical properties is emphasized. Laboratory sections emphasize the effects of bulk and surface treatment methods upon mechanical properties. *Preq:* CRE 310 or equivalent training.

464, 664 Industrial Corrosion of Metals 3(3,0) Emphasizes the technical aspects of corrosion as they affect various industrial and manufacturing operations. The eight basic types of metallic corrosion are identified and discussed in terms of both plant operation parameters and fundamental electrochemical cell reactions. Techniques used to control corrosion are discussed. *Preq:* CRE 310 or equivalent and a first course in thermodynamics.

800 Seminar in Materials Research 1(1,0)

- 820 Deformation Mechanisms in Solids 3(3,0)
822 Chemical Metallurgy 3(3,0)
824 Extractive Metallurgy 3(3,0)
826 Phase Equilibria in Materials Systems 3(3,0)
827 Kinetics of Phase Transformation 3(3,0)
891 Master's Research. Credit to be arranged.

MATHEMATICAL SCIENCES (MTHSC)

Professors: K. Alam, J. V. Brawley, Jr., F. M. Cholewinski, P. M. Dearing, R. E. Fennell, W. R. Hare, Jr., R. E. Haymond, P. T. Holmes, R. E. Jamison, J. P. Jarvis, J. W. Kenelly, R. C. Laskar, D. R. LaTorre, R. F. Ling, J. K. Luedeman, S. M. Lukawecki, T. G. Proctor, J. A. Reneke, R. D. Ringelsen, *Head:* W. H. Ruckle, K. T. Wallenius, D. D. Warner; *Associate Professors:* A. K. Bose, J. R. Brannan, A. S. Cover, J. C. Harden, Jr., C. D. Jeffries, M. M. Kostreva, W. F. Moss III, J. R. Nedelman, C. B. Russell, H. F. Senter, K. Seo, F. E. Sullivan; *Assistant Professors:* W. P. Adams, S. Y. Chang, C. L. Cox, V. J. Ervin, I. B. Fetta, K. B. Kulasekera, J. G. LaTorre, J. H. Nicholson, C. L. Williams; *Visiting Associate Professors:* R. D. Baker, J. D. Key, J. R. Sullivan; *Visiting Assistant Professors:* S. K. Stueckle, M. M. Wiecek; *Lecturers:* P. F. Garner, S. M. McIntyre, J. R. Thornton

101 Finite Probability 3(3,0) Topics include probability, discrete random variables, and probability distributions. May not be taken by students who have successfully completed MTHSC 301. *Preq:* A satisfactory score on the Mathematics Test, Level II (Standard) or consent of instructor.

102 Introduction to Mathematical Analysis 3(3,0) An intuitive approach to the concepts and applications of calculus. Topics include functions and graphing, differentiation, and integration. Applications from social, biological, and management sciences are presented. Not open to those receiving credit for MTHSC 106. *Preq:* A satisfactory score on the Mathematics Test, Level II (Standard) or consent of instructor.

105 Algebra and Trigonometry 5(5,0) Unified course in algebra and trigonometry. Properties of real numbers, algebraic expressions, equations and inequalities, relations and functions, polynomial and rational functions, exponential and logarithmic functions, trigonometric functions and conditional equations and complex numbers. May not be taken by students who have passed MTHSC 106.

106, H106 Calculus of One Variable I 4(4,0) Topics include analytic geometry, introduction to derivatives, computation and application of derivatives, integrals, exponential and logarithm functions. *Preq:* MTHSC 105, or a satisfactory score on the Mathematics Test, Level II (Standard) or consent of instructor.

108, H108 Calculus of One Variable II 4(4,0) Topics include infinite series, limits, differentiation and techniques of integration. *Preq:* MTHSC 106.

109 Algebra and Trigonometry for Teachers 3(3,0) Unified course in algebra and trigonometry. Complex number system, functions, graphs, solving equations and inequalities, trigonometry, sequences, series, combinations, and permutations. A refresher course for teachers assigned to teach in a school's college preparatory program. Enrollment limited to inservice teachers.

110 Analytic Geometry for Teachers 3(3,0) Algebraic techniques applied to geometry; lines, conic sections and their graphs; transformations of coordinates; general second-degree equations; parametric equations; polar coordinates. Restricted to inservice teachers. *Preq:* MTHSC 109 or equivalent.

115 Contemporary Mathematics for Elementary School Teachers I 3(3,0) Logic, sets, and the properties of the counting numbers, numeration systems. Open only to Elementary Education majors. *Preq:* Consent of instructor.

116 Contemporary Mathematics for Elementary School Teachers II 3(3,0) Continuation of MTHSC 115. Subtraction, properties of the integers, elementary number theory, rational number system, real number system. Open only to Elementary Education majors. *Preq:* MTHSC 115 or consent of instructor.

119 Introduction to Discrete Methods 3(3,0) Topics normally will include elementary logic and methods of proof; sets, functions, and relations; graphs and trees; combinatorial circuits and Boolean Algebra. *Preq:* Satisfactory score on the Mathematics Test, Level II (Standard).

- 129 Problem Solving in Discrete Mathematics 3(2,2)** A problem-solving approach to learning mathematics will be applied to topics in modern discrete mathematics. Typical selection of topics will include logic and proof, sets, relations, functions, mathematical induction, graphs and trees, counting techniques, recurrence equations. For Bachelor of Science and Bachelor of Arts majors in Mathematical Sciences only. Credit may not be received for both MTHSC 119 and 129. *Preq:* MTHSC 106.
- 203 Elementary Statistical Inference 3(3,0)** Survey course in fundamental statistical principles with applications. Topics include estimation, test of hypotheses, regression and correlation, analysis of variance, and nonparametric statistics. May not be taken by students who have passed MTHSC 301. *Preq:* MTHSC 101.
- 206, H206 Calculus of Several Variables 4(4,0)** Topics include real valued functions of several variables, multiple integration, differential calculus of functions of several variables, vector field theory. *Preq:* MTHSC 108.
- 207 Multivariable Calculus 3(3,0)** Introduction to the calculus of several variables. Topics include functions of several variables, differential calculus and optimization of several variables, multiple integrals. Topics from the management sciences will be used to illustrate the above concepts. May not be taken by students who have passed MTHSC 206. *Preq:* MTHSC 102, or 106 with consent of instructor.
- 208, H208 Introduction to Ordinary Differential Equations 4(4,0)** Introduction to the study of differential equations and their application to physical problems. Topics include exact, series, and numerical solutions; solutions by means of Laplace transforms; and solutions of systems of differential equations. *Preq:* MTHSC 206.
- 210 Applied Matrix Algebra 3(3,0)** Introduction to the basic principles of matrix algebra with applications to the behavioral and managerial sciences. The major areas of application will include linear programming, directed graphs, and game theory. *Preq:* MTHSC 101 and 102 or 106.
- 215 Algebra for Elementary School Teachers 3(3,0)** Linear equations and linear inequalities in one variable, functions and graphs, systems of linear equations and linear inequalities, quadratic equations, complex number system. Finite number systems, algebraic structures. Open only to Elementary Education majors. *Preq:* MTHSC 216.
- 216 Geometry for Elementary School Teachers 3(3,0)** An informal treatment of the basic concepts of geometry. Open only to Elementary Education majors. *Preq:* MTHSC 116 or consent of instructor.
- 231 Mathematics of Life Insurance 3(3,0)** Introduction to the basic mathematics of finance and life insurance. Topics include compound interest, annuities certain, mortality tables, life annuities, net premiums, net level reserves, modified reserves, nonforfeiture values and dividends.
- 232 Actuarial Science Seminar I 1(1,0)** Problem-solving seminar designed to prepare the student for the Society of Actuaries Examination I (General Mathematics). *Preq:* MTHSC 206.
- 250 Introduction to Mathematical Sciences 1(1,0)** Lectures and discussions on the mathematical sciences disciplines: Actuarial Science, Applied Mathematics, Computing Science, Core Mathematics, Management Science, Operations Research, and Statistics. *Preq:* MTHSC 106.
- 301, H301 Statistical Theory and Methods I 3(3,0)** Principal topics include elementary probability theory, discrete and continuous random variables, expected values, normal distribution, chi-square distribution, t-distribution, F-distribution, test of hypotheses, point and interval estimation, curve fitting. *Preq:* MTHSC 106 or 207 or 210.
- 308 College Geometry 3(3,0)** Theorems and concepts more advanced than those of high school geometry. A treatment of the various properties of the triangle, including the notable points, lines, and circles associated with it. *Preq:* MTHSC 106.
- 311, H311 Linear Algebra 3(3,0)** Introduction to the algebra of matrices, vector spaces, polynomials, and linear transformations. *Preq:* MTHSC 108 or consent of instructor.
- 360 Intermediate Mathematical Computing 3(3,0)** Continuing study of mathematical computing using the FORTRAN language. Emphasis on subroutine computation with applications to problems in science and engineering. *Preq:* CPSC 110 or consent of instructor.
- 400, H400, 600 Theory of Probability 3(3,0)** Principal topics include combinatorial theory, probability axioms, random variables, expected values; special discrete and continuous distributions, jointly distributed random variables, correlation, conditional expectation, law of large numbers, central limit theorem. *Preq:* MTHSC 206 or consent of instructor.

401, H401, 601 Statistical Methodology 3(3,0) Probability-based treatment of statistical methods. Topics include point and interval estimation, hypothesis testing, analysis of variance, regression and correlation, analysis of categorical data, and distribution-free procedures. *Preq:* MTHSC 311 and 400.

403, H403, 603 Introduction to Statistical Theory 3(3,0) Principal topics include sampling distributions, point and interval estimation, maximum likelihood estimators, method of moments, least squares estimators, tests of hypothesis, likelihood ratio methods, regression and correlation analysis, introduction to analysis of variance. *Preq:* MTHSC 400 or equivalent.

405, 605 Statistical Theory and Methods II 3(3,0) Principal topics include simple linear regression, multiple regression and correlation analysis, one-way analysis of variance, multiple comparison, multifactor analysis of variance, experimental design. Computation and interpretation of results are facilitated through use of statistical computer packages. *Preq:* MTHSC 301.

406, 606 Sampling Theory and Methods 3(3,0) Probability-based treatment of sampling methodology. Theory and application of estimation techniques will be treated, using simple and stratified random sampling, cluster sampling, and systematic sampling. *Coreq:* MTHSC 401.

407, 607 Regression and Time-Series Analysis 3(3,0) Theory and application of the regression and time series. Approaches to empirical model building and data analysis are treated. Computation and interpretation of results are facilitated through the use of interactive statistical packages. *Preq:* MTHSC 401.

408, 608 Topics in Geometry 3(3,0) Introduction to topics in special geometries which include non-Euclidean space concepts such as projective geometry, finite geometries, and intuitive elementary topology. A brief introduction to vector geometry. *Preq:* MTHSC 206.

412, H412, 612 Introduction to Modern Algebra 3(3,0) Introduction to the concepts of algebra. Topics included are the number system and the elementary theory of groups, rings, and fields. *Preq:* MTHSC 311.

415, H415 Introduction to Topology 3(3,0) Introduction to point set topology; Hausdorff, regular and normal spaces; metric, connected and compact spaces; continuous mappings and homeomorphisms. *Preq:* MTHSC 206.

419, H419, 619 Discrete Mathematical Structures I 3(3,0) This course applies theoretical concepts of sets, functions, binary relations, graphs, Boolean algebras, propositional logic, semigroups, groups, homomorphisms, and permutation groups to computer characteristics and design, words over a finite alphabet and concatenation, binary group codes, and other communication or computer problems. *Preq:* MTHSC 311.

420, 620 Discrete Mathematical Structures II 3(3,0) This course applies graph theory, ring and field theory, cardinality of sets, and difference equations of Nim games and other perfect information games, transport networks, shortest route problems, polynomial codes, Bose-Chandhuri-Hoquenghem codes, machine computability, mathematical linguistics, and different codes. *Preq:* MTHSC 412, 419, or consent of instructor.

425, H425 Orthogonal Functions and Boundary Value Problems 3(3,0) Continuation of MTHSC 208. Introduction to Fourier Series, numerical methods, partial differential equations, and certain special functions is given. *Preq:* MTHSC 208.

432 Actuarial Science Seminar II 1(1,0) Problem-solving seminar designed to prepare the student for the Society of Actuaries Examination 2 (probability and statistics). *Preq:* MTHSC 403 may be taken concurrently or consent of instructor.

434, 634 Advanced Engineering Mathematics 3(3,0) Fourier series, Laplace and Fourier transform and numerical methods for solving initial value and boundary-value problems in partial differential equations are developed. Applications to diffusion wave and Dirichelet problems are given. Matrix methods and special functions are utilized. *Preq:* MTHSC 208.

435, H435, 635 Complex Variables 3(3,0) Elementary functions. Differentiation and integration of analytic functions. Taylor and Laurent series. Contour integration and residue theory. Conformal mapping. Schwartz-Christoffel transformation. *Preq:* MTHSC 206.

440, H440, 640 Linear Programming 3(3,0) Introduction to linear programming covering the simplex algorithm, duality, sensitivity analysis, network models, formulation of models, and the use of

simplex codes to solve, interpret, and analyze problems. *Preq:* MTHSC 206, 311, or consent of instructor.

441, H441, 641 Introduction to Stochastic Models 3(3,0) Introductory treatment of stochastic processes, finite-state Markov chains, queueing, dynamic programming, Markov decision processes, reliability, decision analysis, and simulation. Both theory and applications will be stressed. *Preq:* MTHSC 400.

450 Introduction to Mathematical Models 3(3,0) Study of the modeling process which will include the translation of practical problems into mathematical models, the solution of the mathematical models, and the interpretation of the solution back into practical problems. Examples will be chosen from the physical, biological, social, and management sciences. *Preq:* CPSC 110, MTHSC 208. *Coreq:* MTHSC 401 or consent of instructor.

453, H453, 653 Advanced Calculus I 3(3,0) Limits, continuity, and differentiation of functions of one and several variables, the Riemann integral, and vector analysis. *Preq:* MTHSC 206.

454, H454, 654 Advanced Calculus II 3(3,0) Continuation of MTHSC 453. Transformations, multiple integrals, line and surface integrals, infinite sequences and series, and improper integrals.

457, 657 Applied Mathematics I 3(3,0) Formulation and analysis of mathematical models of phenomena in the natural sciences. Probabilistic foundations of diffusion theory. Dimensional analysis, scaling, asymptotic series, and perturbation methods. Examples from biology, classical mechanics, and physical chemistry. *Preq:* MTHSC 425, 434 or 454.

458, 658 Applied Mathematics II 3(3,0) Continuation of MTHSC 457. *Preq:* MTHSC 457.

460, 660 Introduction to Numerical Analysis I 3(3,0) Introduction to the problems of numerical analysis emphasizing computational procedures and application. Topics include sources of error and conditioning, matrix methods, systems of linear equations, nonlinear equations, interpolation and approximation by splines, polynomials, and trigonometric functions. *Preq:* MTHSC 206 or 207 and 360 or equivalent.

461, 661 Introduction to Numerical Analysis II 3(3,0) Continuation of MTHSC 460. Ordinary differential equations, boundary value problems, functional approximation, numerical solution of partial differential equations, and Monte Carlo techniques. *Preq:* MTHSC 208 and 460 or consent of instructor.

463, H463, 663 Mathematical Analysis I 3(3,0) Basic properties of the real number system, sequences and limits; continuous functions, uniform continuity and convergence. Integration, differentiation, functions of several real variables, implicit function theory. *Preq:* MTHSC 206.

464, H464, 664 Mathematical Analysis II 3(3,0) Continuation of MTHSC 463.

481 Seminar in Mathematics 1-3(1-3,0) Attention will be focused upon mathematical areas in which nonroutine problems can be posed with comparative ease. Emphasis will be upon independent study and student use of previously acquired mathematical skills. Open to students only by invitation for not more than three hours credit.

700 Mathematical Computer Applications for Elementary Teachers 3(3,0)

701 Number Systems for the Elementary Grades 3(3,0)

702 Number Systems for the Middle Grades 3(3,0)

703 Modern Mathematics for Elementary School Teachers—Geometry 3(3,0)

705 Modern Mathematics for Elementary School Teachers—Algebra, Probability and Statistics 3(3,0)

707 Mathematics for Middle School Teachers: Algebra 3(3,0)

709 Mathematics for Middle School Teachers: Geometry 3(3,0)

710 Elementary Calculus from an Advanced Viewpoint 3(3,0)

711 Elementary Calculus from an Advanced Viewpoint II 3(3,0)

712 Modern Algebraic Concepts 3(3,0)

715 Ordinary Differential Equations with Applications 3(3,0)

719 Discrete Mathematics 3(3,0)

721 Matrix Algebra I 3(3,0)

722 Matrix Algebra II 3(3,0)

- 723 Applications of Linear and Modern Algebra 3(3,0)
- 725 Combinatorial Mathematics for Teachers 3(3,0)
- 727 Analysis Concepts for Teachers I 3(3,0)
- 728 Analysis Concepts for Teachers II 3(3,0)
- 730 Modern Geometry for Teachers 3(3,0)
- 731 Non-Euclidean Geometry 3(3,0)
- 732 Projective Geometry 3(3,0)
- 741 Introduction to Linear Programming with Applications 3(3,0)
- 751 Fundamental Concepts of Calculus I 3(3,0)
- 761 Probability and Statistics for Teachers 3(3,0)
- 771 Numerical Methods in Secondary School Mathematics I 3(3,0)
- 772 Numerical Methods in Secondary School Mathematics II 3(3,0)
- 781 History of Mathematics 3(3,0)
- 783 Theory of Numbers 3(3,0)
- 791 Mathematical Problems in the Curriculum 3(3,0)
- 800 Probability 3(3,0)
- 801 General Linear Hypothesis I 3(3,0)
- 802 General Linear Hypothesis II 3(3,0)
- 803 Stochastic Processes I 3(3,0)
- 804 Stochastic Processes II 3(3,0)
- 805 Data Analysis 3(3,0)
- 806 Nonparametric Statistics 3(3,0)
- 807 Applied Multivariate Analysis 3(3,0)
- 808 Reliability and Life Testing 3(3,0)
- 809 Time-Series Analysis, Forecasting and Control 3(3,0)
- 810 Mathematical Programming 3(3,0)
- 811 Nonlinear Programming 3(3,0)
- 812 Discrete Optimization 3(3,0)
- 813 Advanced Linear Programming 3(3,0)
- 814 Network Flows 3(3,0)
- 815 Data Structures 3(3,0)
- 816 Graph Algorithms 3(3,0)
- 817 Stochastic Models in Operations Research I 3(3,0)
- 818 Stochastic Models in Operations Research II 3(3,0)
- 821 Linear Analysis 3(3,0)
- 822 Measure and Integration 3(3,0)
- 823 Complex Analysis I 3(3,0)
- 824 Complex Analysis II 3(3,0)
- 825 Introduction to Dynamical Systems Theory 3(3,0)
- 826 Partial Differential Equations 3(3,0)
- 831 Fourier Series 3(3,0)
- 837 Calculus of Variation and Optimal Control 3(3,0)
- 841 Applied Mathematics I 3(3,0)
- 842 Applied Mathematics II 3(3,0)
- 850 Computational Problems in Discrete Structures 3(3,0)
- 851 Abstract Algebra I 3(3,0)
- 852 Abstract Algebra II 3(3,0)
- 853 Matrix Analysis 3(3,0)

- 854 Theory of Graphs 3(3,0)
- 855 Combinatorial Analysis 3(3,0)
- 856 Applicable Algebra 3(3,0)
- 861 Advanced Numerical Analysis I 3(3,0)
- 862 Advanced Numerical Analysis II 3(3,0)
- 863 Digital Models I 3(3,0)
- 864 Digital Models II 3(3,0)
- 867 Systems and Software 3(3,0)
- 868 Introduction to Scientific Computing 3(3,0)
- 881 Mathematical Statistics 3(3,0)
- 882 Monte Carlo Methods 3(3,0)
- 885 Advanced Data Analysis 3(3,0)
- 891 Master's Research. Credit to be arranged.
- 892 Master's Project Course 1(0,1)
- 901 Probability Theory I 3(3,0)
- 902 Probability Theory II 3(3,0)
- 907 Multivariate Analysis 3(3,0)
- 920 Introduction to Harmonic Analysis 3(3,0)
- 927 Functional Analysis I 3(3,0)
- 928 Functional Analysis II 3(3,0)
- 954 Advanced Graph Theory 3(3,0)
- 981 Special Topics in Mathematical Statistics 1-3(1-3,0)
- 982 Special Topics in Analysis 1-3(1-3,0)
- 983 Special Topics in Computational Analysis 3(3,0)
- 984 Special Topics in Applied Mathematics 1-3(1-3,0)
- 985 Special Topics in Algebra 1-3(1-3,0)
- 986 Special Topics in Convexity 1-3(1-3,0)
- 987 Special Topics in Numerical Processes 1-3(1-3,0)
- 988 Special Topics in Operations Research 1-3(1-3,0)
- 991 Doctoral Research. Credit to be arranged.

MECHANICAL ENGINEERING (ME)

Professors: N. R. Bauld, Jr., E. H. Bishop, W. E. Castro, M. W. Dixon, J. L. Gaddis, J. G. Goree, E. H. Law, J. A. Liburdy, F. W. Paul, C. E. Przirembel, *Head:* H. J. Rack, J. S. Wolf, T. Yang; *Associate Professors:* D. E. Beasley, R. S. Figliola, L. P. Golan, I. Haque, C. O. Huey, Jr., J. E. Jackson, Jr.; *Assistant Professors:* A. Bagchi, M. Grujicic, C. C. Jara-Almonte, J. Jara-Almonte, J. M. Kennedy, R. Kumar, T. Wang, D. A. Zumbunnen; *Lecturer:* C. K. Roby; *Visiting Instructor:* J. F. Wigenraad

201 Foundations of Engineering Design 2(2,0) The design process, design planning, engineering design analysis with emphasis on modern concepts and methods, design documentation, engineering professional ethics, patents, human factors, codes and standards. *Preq:* Sophomore standing. *Coreq:* EG 208.

202 Engineering Materials and Manufacturing Processes 2(2,0) Decision making in the selection of materials and processes for manufacturing products. Product design principles. *Preq:* ME 201. *Coreq:* CRE 310.

208 Numerical Methods in Engineering 3(3,0) Application of undergraduate mathematics, and basic engineering principles, with an emphasis on numerical methods, in the solution of engineering problems. Problems will be drawn from dynamics, vibrations, kinematics, thermodynamics, heat transfer, fluid mechanics, electrical circuits, and other engineering fields. *Coreq:* MTHSC 208.

H300 Junior Honors Seminar 0 Designed to acquaint students enrolled in the Departmental Honors program with current research activities in the Department of Mechanical Engineering. The faculty will provide seminars where research interests are summarized. These seminars are planned to prepare students in choosing a research topic for the senior thesis. *Preq:* Departmental Honors student with Junior standing.

302 Dynamic Systems Modeling 3(3,0) Model formulation of engineering systems based on physical laws involving the storage and transfer of matter and energy. Mechanical, electrical, fluid, and thermal systems are emphasized. Time and frequency response methods are considered. An introduction to control system characteristics of stability and feedback. *Preq:* EM 202, MTHSC 208.

304 Heat Transfer 3(3,0) Heat conduction in the steady and transient states, free and forced convection, radiation, combined modes, boiling and condensation. Analytical and numerical solutions to engineering heat transfer problems are emphasized. *Preq:* ME 208 and 311 or equivalent, MTHSC 208.

306 Fundamentals of Machine Design 3(3,0) Introduction to failure theory, fatigue analysis, and energy methods for deflection analysis. Integration of these topics with selected portions of mechanics of materials and application of them to the design and analysis of machine elements. *Preq:* EM 304.

310 Thermodynamics and Heat Transfer 3(3,0) Introduction to thermodynamics and heat transfer for nonmajors: Properties of liquids and gases, first and second law analysis, introduction to cycles for power and refrigeration, heat flow by conduction and radiation, and convective heat flow and heat exchangers. *Preq:* Junior standing in an Engineering curriculum.

311, H311 Engineering Thermodynamics I 3(3,0) First and second laws of thermodynamics applied to engineering systems. Properties of the ideal and real gases and vapors. Processes and introduction to power and refrigeration cycles. *Preq:* MTHSC 208, PHYS 221, Junior standing.

312 Engineering Thermodynamics II 3(3,0) Continuation of ME 311. Power and refrigeration cycles, thermodynamic relations, compressibility charts, combustion, and introduction to equilibrium. *Preq:* ME 311.

313 Instrumentation and Measurements 3(2,3) Principles of measurements, instrument accuracy and performance characteristics. Modern instrumentation for measuring both static and dynamic pressure, temperature, fluid flow, speed, power, force, acceleration, etc. Uncertainty analysis, curve fitting, and technical report writing. Analog and digital computer methods for engineering experimentation. *Preq:* ECE 307, ME 302, Junior standing.

400 Senior Seminar 1(1,0) Seminars address the problems to be encountered by engineering graduates in professional practice. Invited lecturers as well as faculty provide the lectures and demonstrations. *Preq:* Senior standing.

402 Internship in Engineering Design 2(1,3) Student is given the opportunity to apply creatively his general knowledge of engineering in the solution of an open-ended design problem involving engineering systems, machines, or devices. The source of the problem is external to the university and the students' progress in its solution is monitored and evaluated by a faculty jury. *Preq:* Senior standing.

404, 604 Control Systems Design 3(3,0) Analysis and design of feedback and control systems using principles of transient response, root locus, frequency response and state variable analyses. Experimental and analytic evaluation of laboratory control systems. *Preq:* ME 302 or equivalent.

405 Kinematics and Dynamics of Machinery I 3(3,0) Graphical, analytical, and numerical techniques are used in the dynamic analysis and synthesis of machines. Emphasis on the application of these analysis techniques to planar linkages. *Preq:* EM 202 and Senior standing.

407, 607 Applied Heat Transfer 3(3,0) Application oriented extension of ME 304, considering topics in transient conduction, flow of fluids, energy exchange by radiation, and mass transfer. Applications in heat-exchanger design with emphasis on economics and variation of operating conditions from the design point. *Preq:* ME 304 and consent of instructor.

410, 610 Fracture and Fatigue Control in Engineering Structures 3(3,0) Phenomena of static fracture and dynamic (fatigue) failure are investigated qualitatively and quantitatively. Design approaches for preventing these types of failures are presented, including fracture mechanics, strain-life (C-N) and stress-life (S-N) methods. *Preq:* ME 306 or equivalent.

- 411, 611 Gas Power Systems 3(3,0)** Study of the effects of variation in specific heat, some fundamentals of compressible flow, the combustion process, and chemical dissociation. The theoretical and actual processes associated with the gas turbine, the thermal jet, the thermal rocket, and the spark ignition and compression ignition engines are analyzed. *Preq:* ME 312.
- 412 Introduction to Compressible Flow and Turbomachinery 3(3,0)** Introductory concepts to compressible flow. Methods of treating one-dimensional gas dynamics including flow in nozzles and diffusers, normal shocks, and methods of measuring the velocity in compressible flow. Also included are theories of energy transfer and flow of compressible fluid in turbomachinery. *Preq:* EM 320, ME 312.
- 413 Thermal Systems Laboratory 1(0,3)** Experimental investigations in such areas as internal combustion engines, air-conditioning, refrigeration, steam turbines, steam condensers, etc. *Preq:* ME 304, 312, 313.
- 414 Mechanical Systems Laboratory 1(0,3)** Investigations of natural phenomena arising within the areas of dynamics, vibrations, and elasticity. Experiments include friction, photoelasticity, critical speed of shafts, frequency response, and others. *Preq:* EM 304, ME 313. *Coreq:* ME 405.
- 415, H415 Undergraduate Research 1-3** Individual research projects to be conducted under the direct supervision and guidance of a faculty member. May be repeated for a maximum of six credits. *Preq:* Consent of instructor.
- 418, 618 Finite Element Analysis of Mechanical Engineering Systems 3(3,0)** Introduction to the finite element method. Conventional and isoparametric elements. Numerical integration. Applications to heat transfer, fluid flow, and solids. Introduction to time-dependent and nonlinear solution methods. *Preq:* Senior standing in Engineering.
- 420, 620 Energy Sources and Their Utilization 3(3,0)** Covers the availability and use of energy sources such as fossil fuels, solar (direct and indirect) and nuclear. Addresses energy density and constraints to use (technical and economic) for each source. *Preq:* ME 312.
- 422, 622 Design of Gas Turbines 3(3,0)** Guiding principles in gas turbine cycles are reviewed. Turbine and compressor design procedures and performance prediction for both axial and radial flow machines are presented. Methods of design of rotary heat-exchangers and retrofitting gas turbine for regenerative operation are presented. Design projects are used to illustrate the procedures. *Preq:* EM 320, Senior standing.
- 423, 623 Introduction to Aerodynamics 3(3,0)** Basic theories of aerodynamics are presented with the purpose of accurately predicting the aerodynamic forces and moments which act on a vehicle in flight. *Preq:* EM 320, Senior standing.
- 425, 625 Kinematics and Dynamics of Machinery II 3(3,0)** Graphical, analytical, and numerical techniques are used in the dynamic analysis and synthesis of machines. Emphasis on the application of the analysis techniques to cams, gears, and other mechanisms. *Preq:* ME 405.
- 429, 629 Thermal Environmental Control 3(3,0)** Mechanical vapor compression refrigeration cycles, refrigerants, thermoelectrical cooling systems, cryogenics, thermodynamic properties of air, psychrometric charts, heating and cooling coils, solar radiation, heating and cooling loads, insulation systems. *Preq:* ME 312.
- 430, 630 Fluid Power—Hydraulics 3(3,0)** Engineering analysis of hydraulic system components and circuits. Topics covered will include hydraulic fluids, contamination and filtering, power generators, transmission lines, control valves, and system concepts. *Preq:* EM 320.
- 452, 652 (AGE) Safety Engineering 3(3,0)** Basic principles of industrial safety, inspections for safety compliance, design codes, design of machines and industrial equipment to meet safety standards, fire protection and control, safety laws and regulations, protective equipment. *Preq:* Senior standing.
- 453, 653 Dynamic Performance of Vehicles 3(3,0)** Introduces techniques for analyzing the dynamic behavior of vehicles. Types of vehicles to be considered will be chosen from aircraft, surface ships, automobiles and trucks, railway vehicles, and magnetically levitated vehicles. *Preq:* ME 208 and 302.
- 454, 654 Design of Machine Elements 3(3,0)** Design of common machine elements including clutches, brakes, bearings, springs, and gears. Optimization techniques and numerical methods are employed as appropriate. *Preq:* ME 208, 306, or consent of instructor.
- 455, 655 Design for Computer-Automated Manufacturing 3(3,0)** Concepts of product and process design for automated manufacturing are considered. Topics include product design for automated

manufacturing, product design for assembly, automating parts production, computer machine automation, use of industrial robots, computer hierarchy for manufacturing and control, and concepts of flexible product manufacture. *Preq:* ME 202, 306, or consent of instructor.

456, 656 Design and Application of Industrial Robots 3(3,0) Considers the mechanics and control of industrial robots and their application to manufacturing problems. Topics covered include robot geometry, kinematics, and dynamics; servomechanisms, control and process application; programming; and integration into manufacturing applications. *Preq:* ME 404 or consent of instructor.

459, 659 Materials Selection in Design 3(3,0) Introduction to the systematic materials selection process with emphasis on metallic materials for specific applications. Polymeric, ceramic, and composite materials will also be considered. Case studies will be the primary mode of instruction, supplemented with laboratory demonstrations. *Preq:* ME 306 or consent of instructor.

460, 660 Deformation Processing 3(3,0) Processing for shape change and property control by plastic deformation are considered. Criteria controlling the interaction of metal flow, tooling, and product configuration/performance are developed. *Preq:* CRE 310, EM 304, Senior standing.

493, 693 Selected Topics in Mechanical Engineering 1-6 Study of topics not found in other courses. *Preq:* Consent of instructor.

701 Applications of Engineering Analysis 3(3,0)

801 Foundations of Fluid Mechanics 3(3,0)

807 Mechanical Systems 3(3,0)

810 Macroscopic Thermodynamics 3(3,0)

811 Gas Dynamics 3(3,0)

812 Experimental Methods in Thermal Science 3(2,2)

814 Concepts of Turbulent Flow 3(3,0)

815 (PHYS) Statistical Thermodynamics I 3(3,0)

816 Energy Conversion 3(3,0)

817 Combustion Theory 3(3,0)

819 Computational Methods in Thermal Sciences 3(3,0)

820 Modern Control Engineering 3(3,0)

821 Advanced Control Engineering 3(3,0)

822 Computer Control of Automated Machines 3(3,0)

830 Conduction Heat Transfer 3(3,0)

831 Convective Heat Transfer 3(3,0)

832 Radiative Heat Transfer 3(3,0)

833 Heat Transfer with Change of Phase 3(3,0)

841 Advanced Mechanical Engineering Design I 3(3,0)

842 Advanced Mechanical Engineering Design II 3(3,0)

843 Nonlinear Dynamics of Mechanical Systems 3(3,0)

844 Random Vibrations: Theory and Measurement 3(3,0)

845 Vibration of Continuous Media 3(3,0)

851 Tribology 3(3,0)

890 Engineering Project 1-3(0,3-9)

891 Master's Research. Credit to be arranged.

893 Selected Topics in Mechanical Engineering 1-6(1-6,0)

930 Advanced Topics in Heat Transfer 1-6(1-6,0)

931 Advanced Topics in Fluid Mechanics 3(3,0)

932 Advanced Topics in Thermodynamics 3(3,0)

991 Doctoral Research. Credit to be arranged.

MEDICAL TECHNOLOGY (MT)

Coordinator: M. V. Ruppert

Anderson Memorial Hospital *Adjunct Professor:* A. S. Hollingsworth, Jr.; *Adjunct Assistant Professor:* G. L. Huff

McLeod Regional Medical Center (Florence) *Adjunct Associate Professor:* V. Hyman; *Adjunct Assistant Professor:* J. Lewallen

101 Introduction to Medical Technology 1(1,0) Introduction to the operation and practices in a medical laboratory. This course is designed to integrate the academic year with the clinical year. Included will be lectures on current laboratory practices, a visit to a modern medical laboratory, current training of laboratory personnel and seminars on areas of specialization.

401 Immunology 3(2,4) Presents the principles of serology and immunology and the tests utilizing these principles to detect abnormalities helpful in the diagnosis of disease. *Preq:* Senior standing in Medical Technology and enrollment in a clinical program.

402 Clinical Microbiology 8(4,11) Principles of microbiology: bacteriology, mycology, virology, and parasitology. Emphasis is placed on human pathogenic organisms, using both fresh and prepared organisms. *Preq:* Senior standing in Medical Technology and enrollment in a clinical program.

403 Hematology and Hemostasis 5(3,7) Information on blood as a tissue, the theory of hematological and hemostasis (coagulation) tests, factors that affect test reliability. Knowledge of blood dyscrasias. Skill in the performance of hematological and hemostasis tests is emphasized and the use of automation techniques is covered. *Preq:* Senior standing in Medical Technology and enrollment in a clinical program.

404 Blood Bank 4(2,6) History and principles of blood-group systems and methods of cross matching. Selection, pretesting, and bleeding of donors and processing of blood for transfusions, including component therapy. *Preq:* Senior standing in Medical Technology and enrollment in a clinical program.

407 Urinalysis 2(1,3) Study of renal function together with principles of urine analysis and anatomy of the urinary system. Emphasis is placed on laboratory procedures and their utilization to detect abnormalities helpful in the diagnosis of disease. *Preq:* Senior standing in Medical Technology and enrollment in a clinical program.

408 Clinical Chemistry 10(6,14) Chemical principles as applied to the analysis of biochemical substances and to physiological processes of clinical importance. Emphasis is placed on the chemistry of blood and urine. Advanced laboratory instruments, statistical analysis, and quality control concepts are covered. *Preq:* Senior standing in Medical Technology and enrollment in a clinical program.

491 Special Topics in Medical Technology 2(1,4) Some or all of the following topics will be covered during the clinical experience: cell physiology, educational principles, laboratory management, scientific reports, research problems, etc. The manner in which the accredited hospital administers the special topics will vary somewhat due to the institutional differences. *Preq:* Senior standing in Medical Technology and enrollment in a clinical program.

495 Medical Technology Clinical Studies 0-17 General enrollment course for students in hospital phase. Specific medical technology credits awarded at end of clinical year. *Preq:* Senior standing in Medical Technology.

MICROBIOLOGY (MICRO)

Professors: O. W. Barnett, Jr., J. W. Dick, E. L. Kline, L. L. Larcom, J. W. Lawson, Jr., M. J. B. Paynter, *Head*; F. J. Stutzenberger; *Associate Professors:* S. F. Barefoot, S. S. Hayasaka; *Assistant Professor:* T. A. Hughes; *Adjunct Associate Professors:* R. J. Brooker, H. F. Cantrell; *Adjunct Professor:* E. J. Brandt

100 Microbes and Human Affairs 1(1,0) An explanation of the roles of microorganisms in today's world and the significance of microbes to the future of mankind.

205 Introductory Microbiology 4(3,3) Basic concepts of microbiology are introduced through classroom and laboratory experiences. Emphasis is on practical applications in various areas of importance to man. Recommended for students not majoring in a biological science. Not open to Microbiology majors. *Preq:* CH 101 and 102, BIOL 103.

305, 605 General Microbiology 4(3,3) Morphology, physiology, classification, distribution, and cultivation of microorganisms and health. *Preq:* Introductory biology, CH 101, 102, or 112.

400, 600 Public Health Microbiology 3(3,0) Epidemiology of transmissible diseases including pathogenic characteristics of the infectious organism, modes of transmission, mechanism of infection, diagnostic aids, effective treatments, immunizing procedures and methods of preventing infection. *Preq:* MICRO 305.

401, H401, 601 Advanced Bacteriology 4(2,6) Metabolism, nutrition, growth, and death of bacteria; microbiological assays and industrial fermentation; emphasis on laboratory procedures for the identification of the more common taxonomic groups. *Preq:* CH 201 or 223, 227, MICRO 305.

403, 603 Marine Microbiology 3(2,3) Discussion of the microbes that inhabit the marine environment, their peculiar physiological traits, and contributions to the ecology of oceans. *Preq:* MICRO 305, Organic Chemistry.

407, H407, 607 Food and Dairy Microbiology 4(3,3) Physical-chemical factors limiting survival and growth of microorganisms during processing and manufacturing of food and dairy products. Standard methods for enumerating and identifying indicator bacteria, yeasts, molds and microbes producing food and foodborne illness. Starter cultures, fungal toxins, microbial cell injury and standards for food and dairy products. *Preq:* BIOCH 210 or CH 201 or 223, MICRO 305.

410, H410, 610 Soil Microbiology 3(2,3) Role of microorganisms in the decomposition of organic substances, transformation of nitrogen and mineral substances in the soil; interrelationships between higher plants and microorganisms; importance of microorganisms in soil fertility. *Preq:* MICRO 305.

411, H411, 611 Pathogenic Bacteriology 4(3,3) Study of pathogenic bacteria, their morphology, cultural requirements and classification; diagnostic tests, methods of differentiation, and the disease caused. *Preq:* MICRO 305.

412, H412, 612 Bacterial Physiology 4(3,3) Consideration of the cytology, physiology, metabolism, and genetics of bacteria. Included will be studies of growth and death, reproduction and mutation, nutrition and metabolic pathways, regulatory mechanisms, and effects of environment. *Preq:* CH 224, MICRO 305, one semester of biochemistry, or consent of instructor.

413, H413, 613 Industrial Microbiology 3(2,3) Microbial aspects of large-scale processes for the production of foods, antibiotics, enzymes, fine chemicals, and beverages. Topics include strain selection, culture maintenance, biosynthetic pathways, continuous cultivation and production of single cell protein. *Preq:* MICRO 305.

414, H414, 614 Basic Immunology 3(2,3) Consideration of the nature, production, and function of basic immune responses in animals. Procedures and mechanisms of antigen-antibody and other immune reactions. *Preq:* MICRO 305, Organic Chemistry.

415, H415, 615 Microbial Genetics 4(3,3) Cytological basis of bacterial, fungal, and viral genetics; molecular aspects; mutations; mechanisms of genetic transfers; episomes and plasmids; and population changes. *Preq:* CH 224, GEN 302, MICRO 305, or consent of the department head.

416, H416, 616 Introductory Virology 3(3,0) General introduction to the field of virology, including animal, bacterial, and plant viruses. Topics will include nomenclature and classification, biochemical and biophysical characteristics, mechanisms of replication, chemotherapy, and techniques for isolation, assay and purification. *Preq:* MICRO 305.

417, H417, 617 Molecular Mechanisms of Carcinogenesis and Aging 3(3,0) Changes which occur at the cellular and subcellular levels during transformation and aging. Accumulated damage and "intrinsic clock" theories of aging; genetic and epigenetic theories of carcinogenesis; epidemiology of cancer; viral, radiation-induced and chemical carcinogenesis; the immune system and cancer. *Preq:* BIOCH 301, MICRO 305, or consent of instructor.

418, 618 (BIOSC) Biotechnology I: Nucleic Acids Techniques 4(2,4) See BIOSC 418.

491 Special Problems in Microbiology 1-3(0,3-9) Research problems in the various areas of microbiology designed to introduce undergraduate students to the planning and execution of research experimentation, and the presentation of research findings.

802 Bacteriological Technic 4(2,6)

803 Special Problems in Microbiology. Credit to be arranged.

- 804 Current Topics in Microbiology 1(1,0)
- 806 Pathogenesis and Infectious Disease 3(3,0)
- 807 Seminar 1(1,0)
- 810 Recombinant DNA and Genetic Engineering in Microbes 4(2,6)
- 811 Bacterial Cytology and Physiology 4(4,0)
- 812 Bacterial Metabolism 3(3,0)
- 815 Advanced Microbial Genetics 3(3,0)
- 891 Master's Research. Credit to be arranged.
- 991 Doctoral Research. Credit to be arranged.

MILITARY SCIENCE (MS)

Professor: B. L. Harris, *Head*; *Assistant Professors:* W. H. Christmas, Jr., J. Cole, M. W. Freeman, B. J. Ivey, P. W. Stockunas

101 Military Science (Basic) 1(1,2) This course examines the role of the Army in today's society, ranks and branches of the Army, principles and techniques of leadership. Laboratory periods provide training in physical conditioning, mountaineering, and weapons safety and firing. One hour lecture per week; two-hour laboratory every week or equivalent.

102 Military Science (Basic) 1(1,2) Study of Army organization and doctrine with additional focus on pay and allowances, other forces, the noncommissioned officer, and fundamentals of first aid. Laboratory periods provide training in mountaineering, weapons safety and firing, and land navigation.

201 Military Science (Basic) I 1(1,2) Introductory study of U.S. Military Weapons Systems. Emphasis is on the historical and practical perspectives of current U.S. Army weaponry. Leadership laboratory provides the students practical experience in applying principles learned and experience in leadership and physical fitness.

202 Military Science (Basic) II 1(1,2) Introduction to principles of warfare and introduction to military land navigation. Leadership laboratory provides the students practical experience in applying the principles learned in class, in addition to experience in leadership and physical training.

203 Introduction to U.S. Military Equipment 1(1,1) Hands-on study of current weapons and equipment in use in the U.S. Army. Emphasis is on the mechanical functioning, maintenance, and operation of each item studied. One-hour lecture per week; two-hour laboratory every week or equivalent.

301 Military Science (Advanced) 1(1,1) Small unit tactics: Analysis of the leader's role in directing and coordinating small units in the execution of offensive and defensive tactical missions. Cadets will enroll in one three-hour enrichment elective outside their major academic discipline. Cadets will participate in leadership laboratory training throughout the school year.

302 Military Science (Advanced) 2(2,1) Organizational leadership and methods of instruction. Study of relevant theories and concepts of organizational leadership and human behavior; techniques used in planning and presenting instruction. Continuation of leadership laboratory.

401 Military Science (Advanced) 1(1,1) Study of military operations, with emphasis on small unit leadership, training, and administration. Subject matter and leadership laboratories are designed to provide requisite knowledge and experience for commissioning and initial military assignment.

402 Military Science (Advanced) 2(2,1) Continuation of MS 401, with emphasis on military justice, law of warfare, and ethics. Subject matter and leadership laboratories are designed to provide requisite knowledge and experience for commissioning and initial military assignment.

MUSIC (MUS)

Professor: B. F. Cook; *Associate Professors:* E. A. Freeman, L. U. Harder, L. Hochheimer; *Assistant Professors:* R. E. Goodstein, M. N. Jessie

151 Applied Music 1(1,0) Individual study in performance medium (voice, piano, flute, oboe, clarinet, saxophone, bassoon, cornet, trumpet, French horn, trombone, baritone, tuba, percussion). One hour-long private lesson each week, for which a minimum of four hours' practice is required. The student is guided in a continuing advance of his technical and artistic proficiency and is required to perform an appropriate solo in a student recital each semester. May be repeated for

credit with departmental approval to allow for the study of differing performance media. *Preq:* Consent of instructor, based on a qualifying audition.

152 Applied Music 1(1,0) Continuation of MUS 151. *Preq:* MUS 151.

205 Music Theory 3(3,0) Terminology and notation of traditional music are reviewed, and the techniques of sight-singing and sight-reading are practiced. Harmonic practices are studied, relating to the principal diatonic triads in all inversions. *Preq:* Consent of instructor, based on musical literacy.

206 Music Theory 3(3,0) Continuation of MUS 205 with emphasis on secondary chord structure, modulation, and nondiatonic harmony. Advanced sight-singing and melodic dictation are practiced. *Preq:* MUS 205.

210 Music Appreciation: Music in the Western World 3(3,0) Designed to deepen the student's appreciation of his musical heritage through a study of the elements of the musical language and its development in Western culture.

251 Applied Music 1(1,0) Continuation of MUS 152. *Preq:* MUS 152 and consent of instructor.

252 Applied Music 1(1,0) Continuation of MUS 251. *Preq:* MUS 251.

301 Special Topics in Music Appreciation 1(1,0) Broad survey of the many and varied aspects of the field of music in terms of media, composition, and performance and ranging in style from the oldest classics to the current popular idioms. Concert attendance is required.

305 Music Theory: Advanced Harmony 3(3,0) Study of harmonic usage involving chromaticism, free dissonance and atonality. Harmonic dictation is practiced. *Preq:* MUS 206.

306 Music Theory: Form Analysis 3(3,0) Principles of formal construction in music of all periods are studied by the inductive analysis of representative works. *Preq:* MUS 206.

311 Music Appreciation: American Music 3(3,0) Music in America from 1620 to the present. Indigenous and borrowed influences will be examined.

312 Introduction to Jazz 3(3,0) Comprehensive survey of jazz elements and styles. A historical perspective from Dixieland to bebop to jazz/rock is included.

315 Music History 3(3,0) Development of Western music from antiquity to 1750, emphasizing representative literature from various styles and periods.

316 Music History 3(3,0) Continuation of MUS 315. Music from 1750 to present.

351 Applied Music 1(1,0) Continuation of MUS 252 for exceptional students, guiding the student in interpretation of advanced solo and ensemble literature. A minimum of eight hours weekly practice is required. Student is also required to perform an appropriate solo in the student recital. *Preq:* MUS 252, recommendation by the MUS 252 professor, and audition before the music faculty of two pieces of contrasting styles.

352 Applied Music 1(1,0) Continuation of MUS 351. Student is required to present a half-recital from memory at the close of the semester. Some, but not all, of the works performed could have been studied in a previous semester. *Preq:* MUS 351 and recommendation by the MUS 351 professor.

361 Marching Band 1(0,3)¹ Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time; may be repeated for credit, with a maximum of four hours of ensemble credit allowable toward a degree. Fall semester only. *Preq:* Consent of director.

362 Symphonic Band 1(0,3)¹ Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time; may be repeated for credit, with a maximum of four hours of ensemble credit allowable toward a degree. *Preq:* Consent of director.

363 Jazz Ensemble 1(0,3)¹ Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performance given periodically in addition to the minimum rehearsal time. May be repeated for credit, with a maximum of four hours' ensemble credit allowable toward a degree. *Preq:* Consent of director.

¹No more than a total of 4 semester credit hours earned in this group of courses (MUS 361, 362, 363, 365, 366, 367) may be used in meeting degree requirements

365 University Chorus 1(0,3)¹ *Ensembles:* Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time; may be repeated for credit, with a maximum of four hours of ensemble credit allowable toward a degree. *Preq:* Consent of director.

366 Show Choir 1(0,3)¹ *Ensembles:* Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time. May be repeated for credit, with a maximum of four hours of ensemble credit allowable toward a degree. *Preq:* Consent of director.

367 Madrigal Singers 1(0,3)¹ *Ensembles:* Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time. May be repeated for credit, with a maximum of 4 hours of ensemble credit allowable toward a degree. *Preq:* Consent of director.

398 Special Topics in Music 3(3,0) Consideration of select areas of study in music not addressed by other music course offerings. May be repeated once. *Preq:* Consent of instructor.

400 Music in the Elementary School Classroom 3(3,0) Designed to give the teacher in the elementary school a familiarity with music suitable for use with children at the elementary level. Recordings of appropriate music, preband instruments, unison and part singing will be included. No previous training in music is required.

401 Methods and Materials in Elementary School Music 3(3,0) Materials, methods and techniques in elementary school. *Preq:* MUS 400.

421 Vocal Arranging 3(3,0) Techniques of arranging for voices and accompanying instruments are studied and appropriate arrangements prepared. *Preq:* MUS 206.

422 Instrumental Arranging 3(3,0) Transpositions, characteristics and range of the instruments of the band and orchestra are studied. Techniques of arranging for small instrumental ensembles are studied and appropriate arrangements prepared. *Preq:* MUS 206.

NURSING (NURS)

Professors: O. S. Hipps, G. A. Tanner; *Associate Professors:* E. M. Baines, S. E. Barger, P. H. Cummings, R. B. Hughes, M. A. Kelly, P. M. Kline, F. M. Oglesby, M. B. Reichenbach; *Assistant Professors:* C. L. Belcher, B. F. Campbell, J. B. Edwards, L. R. Fisher, J. A. Milstead, S. M. Oldaker, F. K. Porcher, A. B. Privette, C. Y. Schwartz, R. A. Spadoni, R. Thompson, S. W. Thompson, P. A. Townsend, M. A. Wetsel; *Lecturers:* T. C. Farris, D. L. Irvine, L. D. Lesley, S. S. O'Neal; *Visiting Assistant Professors:* S. P. Cummings, J. A. Eggert, C. B. Hubbard, M. J. Monghate; *Visiting Instructors:* J. J. Corfman, J. S. Gillespie, C. S. Harmon, B. I. Jordan, P. R. Maybee, J. L. Timms

130 Introduction to Nursing 1(1,0) Introduction to the role of the professional nurse in contemporary society. Open to non-Nursing majors.

131 Introduction to Communication for Health Professionals 1(1,0) Introduction to principles of communication used by nurses and other health professionals. Open to non-Nursing majors.

210 Health Assessment 3(2,3) Introductory nursing course offers a brief overview of the nursing process and interpersonal theory/communication theory. Learning experiences include the campus nursing laboratory and clinical agencies. *Preq:* Sophomore standing.

211 Fundamental Principles of Nursing 4(2,6) Focus on basic nursing skills required to meet human needs and to help persons maintain activities of daily living. The nursing process will be utilized as the basis for providing care. *Preq:* MICRO 205, NURS 131, 210, ZOOL 222.

230 Professionalism in Nursing I 2(2,0) Analysis of the historical development of modern nursing. Consideration of nurses' professional roles in relation to health-care delivery systems, legal issues in nursing, nursing organizations, and influence of values in ethical decisions and nursing practice.

300 Seminar in Health Care Topics 1-4(1-4,0-9) Designed to provide individualized indepth study in a selected health-care area. May have a clinical component and/or special projects. Open to non-Nursing majors. *Preq:* Consent of instructor.

301, H301 Nursing Care of the Childbearing Family 4(2,6) Course focuses on health care of the childbearing family. Emphasis is placed on pathophysiological and psychosocial concepts specific to the childbearing client throughout the childbearing process. *Preq:* NURS 211, PSYCH 340, ZOOL 233.

302, H302 Nursing Care of Children 4(2,6) Course focuses on health problems of infants, children, and adolescents. Emphasis is placed on pathophysiological and psychosocial concepts related to nursing care of children in hospital settings. *Preq:* NURS 211, PSYCH 340, ZOOL 223.

303 Adult Nursing I 7(3,12) Emphasizes pathophysiological and psychosocial influences on health of adult clients. Clinical practice will focus on applying the nursing process in providing care to adult clients and/or families in the acute care setting. Pharmacotherapeutics, nutrition, client education, and discharge planning are included. *Preq:* NURS 211, ZOOL 223.

304 Pathophysiology for Health-Care Professionals 3(3,0) Focuses on disease mechanisms and recognition of the manifestations of these mechanisms in body systems. The discussion will also include pharmacologic and mechanical interventions commonly associated with specific disease processes and application to patient-care situations. Open to non-Nursing majors.

315, H315 The Developing Family in the Community 4(3,3) Focus on childbearing clients, infants, children, and adolescents. Major emphasis on ways in which these individuals may achieve or maintain wellness in the family, home, and community environment. Identification of appropriate nursing strategy that enhance wellness in the community. *Preq:* NURS 211, PSYCH 340, ZOOL 223.

316, H316 Adult Nursing in the Community 4(3,3) Focus on nursing care of adults in family and community settings. Nursing interventions are identified that enhance health in the adult and elderly client. Includes study of diverse life style factors leading to increased or decreased well being of the individual. *Preq:* NURS 211, PSYCH 340, SOC 311, ZOOL 223.

330 Professionalism in Nursing II 2(2,0) Introduction to research in nursing. Focus on analysis of reported research and epidemiological methods in nursing. Ethical, moral, and legal issues are discussed in relation to nursing research. *Preq or Coreq:* EXST 301 or MTHSC 203, or consent of instructor.

350 (PHIL) Technology and Philosophy in Nursing 3(3,0) Analysis of the influence of the increasing application of scientific technology to health-care delivery and concomitant ethical issues.

401, H401 Mental Health Nursing 4(2,6) Study of the ways in which adults interpret and cope with changes in their life patterns utilizing models of crisis intervention. Emphasis is on understanding the dynamics of human relationships as well as the therapeutic role of the nurse. *Preq:* All required 300-level nursing courses except NURS 330.

402, H402 Long-Term Nursing Care 3(1,6) Focus on concepts and issues basic to long-term care. *Preq:* All required 300-level nursing courses except NURS 330.

403, H403 Adult Nursing II 6(4,6) Pathophysiological, psychosocial, intrapersonal focus on health problems related to acute and traumatic conditions. Emphasis is on the concepts of circulation, oxygenation, homeostasis and compensation.

404, H404 Nursing Management 3(1,6) Focus on principles of management and leadership as applied to nursing. Role, health-care delivery systems, and accountability will be considered. *Preq:* All required 300-level nursing courses except NURS 330.

415, H415 Community Health Nursing 3(2,3) Consideration of health promotion activities for community and population groups with emphasis on community assessment, screening, community planning, and health teaching/counseling. *Preq:* All required 300-level nursing courses except NURS 330.

H426 Independent Study 4(2,6) Opportunity for indepth study in an area of special interest in clinical nursing. Laboratory experience is arranged with the instructor. Specific objectives are to be developed by the student with the consent of the instructor under whom the student wishes to study. *Preq:* All 300-level nursing courses except NURS 300 and consent of instructor.

430 Professionalism in Nursing III 2(2,0) The role of the nurse as a change agent using selected leadership and nursing theories. Models for nursing-care delivery, quality assurance, and standards of nursing care are presented. *Preq:* NURS 230 and 330; MGT 307 or SOC 430 or concurrent enrollment; or consent of instructor.

431 Care of the Hospitalized Child with Long-Term Illness 4(2,6) Role of nurse in caring for the child with a long-term or terminal illness with emphasis on adaptations to meeting basic child needs. Laboratory experience in facility providing hospitalization for children. Limited enrollment. *Preq:* All 300-level nursing courses, except NURS 300.

432 Nursing Care of the Person in Crisis 4(2,6) Study of the person with an emotional crisis precipitated by either a physiological or psychological problem. Various theories concerning crisis situations and the nursing interventions necessary to deal with the person in crisis are presented. Nursing laboratory experience in a variety of settings with all age groups. Limited enrollment. *Preq:* All 300-level nursing courses, except NURS 300.

434 Teaching Role of Nurse Practitioner 4(2,6) Study of the nurse's role in health teaching and application of principles of health promotion, maintenance, and restoration. Student selection of a variety of health teaching situations and development of learning resources. Laboratory experience in a variety of settings with all age groups. Limited enrollment. *Preq:* All 300-level nursing courses, except NURS 300.

435 Care of Individuals with Complex and Critical Illness Problems 4(2,6) Comprehensive nursing care to individuals with complex and critical illness problems. Emphasis on care of individuals with neurological, respiratory, and cardiac problems; implications for first aid and emergency care. Laboratory experience in acute-care facilities. Limited enrollment.

437 Introduction to School Health Nursing 4(2,6) Role of nurse in school health programs with emphasis on the health care of the school age child in his usual environment, the home and school. Laboratory experience through schools and community care facilities. Limited enrollment. *Preq:* All 300-level nursing courses, except NURS 300.

438 Coordination in Nursing Care 4(2,6) This course is designed to reinforce and expand the knowledge and skills needed in the coordination of nursing care. Guided activities in planning, implementing, and evaluating skilled nursing in clinical laboratory in health-care agencies. Participation in and evaluation of activities relating to the delivery of nursing-care services are emphasized. Limited enrollment. *Preq:* All 300-level nursing courses, except NURS 300. *Preq or Coreq:* MGT 307 or SOC 430, NURS 430.

439 Nursing of the Aged 4(2,6) Designed to assist the senior student in bridging and synthesizing concepts extracted from a variety of disciplines and applying them to the nursing process in assessing, diagnosing, planning, implementing, and evaluating the care of the aged individual residing in the community. Limited enrollment. *Preq:* All 300-level nursing courses, except NURS 300.

440 Nursing Care of the High-Risk Maternity Client and Her Infant 4(2,6) An indepth study of the high-risk maternity client, her family, and the high-risk infant. Laboratory in a variety of clinical settings. Limited enrollment. *Preq:* All 300-level nursing courses, except NURS 300.

441 Nursing Problems Related to Clients Coping with Cancer 4(2,6) Designed for increasing awareness and knowledge of the multidisciplinary approaches in oncology and the role of the oncology nurse specialist, and to form a basis for viewing cancer problems within a framework for nursing research. Clinical focus is on the assistance indicated for individuals with cancer and their families. Limited enrollment.

442 Nursing in Community Health Settings 4(2,6) Provides opportunity for application of the nursing process with clients in various community settings. Consideration will be given to principles of management and leadership, planning care for given population groups, and nursing roles in specialized areas. *Preq:* NURS 415.

443 Occupational Health Nursing 4(2,6) An indepth study of the role of the occupational health nurse with emphasis on health and safety risks in the workplace, screening, prevention, and wellness. *Preq:* All 300-level nursing courses except NURS 300.

444 Women's Health 4(2,6) Directed study of women's health concepts and issues. Classroom and clinical laboratory activities focus on health-care problems specific to women through the life span. *Preq:* All 300-level nursing courses except 300.

470 Intensive Care Nursing of the Homebound Client 4(2,6) Focus on health problems of the critically ill client in the home. Considerations of high-tech nursing care, family support and health-care financing as they relate to the needs of the critically ill homebound client. *Coreq:* NURS 403 or consent of instructor.

- 801 Family Health Nursing 4(3,3)
804 Nursing Theory 3(3,0)
807 Nursing Research 3(3,0)
812 The Dynamics of Community Health 3(3,0)
825 Theories and Models of Nursing Management 3(3,0)
826 Management of Nursing Services 3(2,3)
827 Foundations of Nursing Education 3(3,0)
828 The College Teacher of Nursing 3(2,3)
831 Adult Nursing I 6(3,9)
832 Adult Nursing II 6(3,9)
833 Rehabilitative Nursing I 6(3,9)
834 Rehabilitative Nursing II 6(3,9)
835 Child Health Nursing I 6(3,9)
836 Child Health Nursing II 6(3,9)
837 Maternal-Infant Nursing I 6(3,9)
838 Maternal-Infant Nursing II 6(3,9)
840 Gerontic Nursing I 6(3,9)
841 Gerontic Nursing II 6(3,9)
879 Special Topics in Nursing 1-3(1-3,0-9)
889 Special Problems in Nursing 1-6(1-6,0)
891 Master's Research. Credit to be arranged.

NUTRITION (NUTR)

(See also courses listed under Animal Science, Biochemistry, Dairy Science, Food Science, and Poultry Science)

Professors: J. C. Acton, A. B. Bodine II, D. L. Cross, R. J. Davis, D. M. Henricks, L. W. Hudson, B. F. Jenny, J. E. Jones, F. E. Pardue, G. C. Skelley, Jr., D. E. Turk, W. P. Williams, Jr.; *Associate Professors:* D. L. Handlin, E. H. Hoyle, M. E. Kunkel, D. D. Lee, Jr., J. C. McConnell, Jr., D. V. Maurice, E. L. Nichols; *Assistant Professors:* J. C. Hoskin, T. C. Jenkins; *Visiting Assistant Professor:* E. C. Turner

201 Introduction to Nutrition 3(3,0) Principles of the nutrition of domestic animals and man include sources, digestion, absorption, utilization and functions of nutrients; effects of dietary deficiencies, and nutrients required for maintenance, growth, reproduction, lactation, work, and egg-shell quality. *Preq:* BIOCH 210, CH 223, or consent of instructor

401, H401, 601 Fundamentals of Nutrition 3(3,0) Biochemical and physiological fundamentals of nutrition applicable to domestic animals and man. Considered are digestive processes, and absorption and metabolism of carbohydrates, lipids, proteins, water, minerals and vitamins. Energy metabolism and comparative anatomy and physiology of digestive systems are discussed. *Preq:* BIOCH 210, CH 223, or consent of instructor.

425, H425, 625 Nutrition and Dietetics 3(3,0) Study of the nutritional value of foodstuffs, the influence of food preparation techniques upon these values, and the development of diets to meet human nutritional requirements. Current concepts in the formulation of therapeutic diets for the treatment of the ill will be emphasized. *Preq:* NUTR 451 or equivalent

451, H451, 651 Human Nutrition 3(3,0) Essentials of nutrition and principle nutritional deficiency conditions. Factors affecting adequacy of dietary intake, methods of determining nutritional status, the development of nutrition standards, and recent advances in human nutrition. *Preq:* Consent of instructor

455, 655 Nutrition and Metabolism 3(3,0) Concepts of metabolism fundamental to understanding normal and therapeutic nutrition will be examined. Bioenergetics as well as metabolism of carbohydrates, lipids, amino acids, vitamins, and minerals as they relate to nutrition will be discussed. *Preq:* NUTR 451 and BIOCH 210 or 423 or 406 or consent of instructor.

- 701 Therapeutic Nutrition 3(3,0)
- 702 Public Health Nutrition 3(3,0)
- 703 Nutrition Education 3(3,0)
- 704 Food Service Systems 3(3,0)
- 705 Nutrition Practicum 1-6(0,1-6)
- 706 Nutrition for Teachers 3(3,0)
- 721 Methods in Human Nutrition I 2(2,0)
- 722 Methods in Human Nutrition II 2(2,0)
- 801 Topical Problems in Nutrition 1-3
- 802 Special Topics in Nutrition 1-3(1-3,0-2)
- 808 Monogastric Nutrition 3(3,0)
- 809 Ruminant Nutrition 3(3,0)
- 811 Carbohydrate Nutrition 2(2,0)
- 812 Nutrition of Carbohydrates and Lipids 3(3,0)
- 813 Nutrition Techniques with Large Animals 2(1,3)
- 814 Nutrition Techniques with Laboratory Animals 2(1,3)
- 815 Lipid Nutrition 2(2,0)
- 816 Amino Acids and Protein Nutrition 2(2,0)
- 817 Mineral Nutrition 2(2,0)
- 818 Vitamins and Minerals 4(3,3)
- 819 Vitamin Nutrition 2(2,0)
- 851 Nutrition Seminar I 1(1,0)
- 852 Nutrition Seminar II 1(1,0)
- 891 Master's Research. Credit to be arranged.
- 991 Doctoral Research. Credit to be arranged.

PACKAGING SCIENCE (PKGSC)

Professors: H. J. Raphael, W. P. Williams, Jr., *Acting Head*; *Associate Professor:* R. F. Testin; *Visiting Assistant Professor:* L. H. Doar, Jr.

- 101 Packaging Orientations 1(1,0)** Overview of the various principles and practices in packaging science, historical development, packaging as a career.
- 102 Introduction to Packaging Science 2(2,0)** The functions of a package; materials, processes and technology used in package development; the relationship of packaging to the corporation, consumer, and society as a whole. *Preq:* PKGSC 101 or consent of instructor.
- 200 Packaging Materials and Manufacturing 2(2,0)** Detailed study of packaging materials including glass, metal, metal foils and sheets, wood, paper, paperboard, plastics, composites, adhesives, coatings, cushioning media; their functional properties in packaging application; and laminating and combining of different packaging materials. *Preq:* PKGSC 102 or consent of instructor.
- 204 Container Systems (Rigid and Flexible) 2(2,0)** Examination of all the packages and containers used to develop systems to distribute products to the ultimate consumer. Compatibility of product and package, structural design, costs and merchandising considerations are stressed. *Preq:* PKGSC 200 or consent of instructor.
- 206 Container Systems Laboratory 1(0,3)** Laboratory practice in sample making, designing and constructing various containers. *Preq:* PKGSC 204 or concurrent enrollment in PKGSC 204.
- 368 Packaging and Society 3(3,0)** Study of the role of packaging in modern-day society. Responsibilities of the packager to protect people and the environment. Package guidelines recommended by civilian and governmental agencies. *Preq:* PKGSC 102 or consent of instructor.
- 401 Packaging Machinery 3(3,0)** A systematic study of machinery used to form, fill, seal, laminate, combine and print continuous and automated packaging lines and auxiliary material handling

equipment, including principles of machine design, operation, selection, and specification. *Preq:* PHYS 207, PKGSC 204, or consent of instructor.

404 Mechanical Properties of Materials and Principles of Package Evaluation 4(4,0) Study of the properties of packaging materials, principles and standard methods (ASTM, TAPPI) of determining these properties. Evaluation of functional properties of packages including study of shock and vibration isolation. *Preq:* PHYS 207, PKGSC 200, 206 or consent of instructor.

420 Package Design and Development 3(3,0) Relationship between packaging and the marketing of consumer goods. Study of the various principles and methods practiced in developing packages, methods used to coordinate package development activities including interfacing with product development, manufacturing, marketing, and purchasing. *Preq:* PHYS 207, PKGSC 404, or consent of instructor.

454 Package Evaluation Laboratory 2(0,6) Laboratory experiments to determine properties or packaging materials and to evaluate the performance of packages including shipping test (shocks and vibration). Student learns how to operate standard testing apparatus and become familiar with industry-recognized test methods and standards. *Preq:* PKGSC 404 or consent of instructor.

PARKS, RECREATION, AND TOURISM MANAGEMENT (PRTM)

Professors: R. H. Becker, L. W. Gahan, G. E. Howard, F. A. McGuire, R. W. McLellan, *Acting Head;* J. L. Stevenson; *Associate Professors:* G. W. Burnett, R. A. Conover, Jr., H. J. Grove, A. E. James, C. D. McDonald, B. J. Mihalik, J. R. Pope, Jr., B. E. Trent, M. Uysal, C. R. White, Jr.; *Assistant Professors:* M. K. McLellan, S. F. Philipp, T. D. Potts, M. H. Wynn

101 Introduction to Leisure Services 3(3,0) Introduces recreation professions and organizations: government, voluntary, and commercial. Overviews professional preparation. Outlines development of man's uses of leisure and evolution of recreation, city parks, natural resources conservation and preservation movements as philosophical forces affecting leisure services.

102 Issues in Leisure Services 3(3,0) Considers current trends, problems, laws, and issues affected by and/or affecting recreation in America.

203 Personal and Community Health 3(3,0) Course deals with health problems, disease prevention and control, school health practices, public health administration, and other health information which may enable one to live intelligently in today's complex society.

204 Sports in Recreation 3(2,3) Administrative and supervisory skills indigenous to public and/or private agency athletic programs are considered. Group instruction is given to individual and team sports, and officiating techniques applicable to these sports are taught.

205 Leisure Programs I 3(2,3) Principles and methods of program development. Time and facility utilization for sports activities, social functions, arts and crafts, outdoor activities, hobbies or special-interest groups, and activities in the cultural and performing arts will be pursued. *Preq:* PRTM 101.

206 Leisure Programs II 1(0,3) Provides the opportunity for a student to conduct a recreation program in a supervised setting. A minimum of 90 hours with a leisure agency approved by the University is required. To be taken pass-fail only. *Preq:* PRTM 205, Sophomore standing in Parks, Recreation, and Tourism Management.

207 Leisure Programs III 1(0,3) Continuation of PRTM 206. Experience will be gained in a leisure situation different from the PRTM 206 exposure. A minimum of 90 hours with a leisure agency approved by the University is required. To be taken pass-fail only. *Preq:* PRTM 205, Sophomore standing in Parks, Recreation, and Tourism Management.

209 (FOR) Forest and Recreation Resources Application of the Microcomputer 3(2,3) Undergraduate students in Parks, Recreation, and Tourism Management will become familiar with microcomputers and software packages: word processing, spreadsheet, database management, and presentation graphics. *Preq:* CPSC 120 and Forestry or Parks, Recreation, and Tourism major.

301 Recreation and Society 3(3,0) The role of recreation in a technological and work-oriented society is investigated. Particular emphasis will be placed on recreation behavior, resources, and programming in public and private organizations which serve the public wants. Not open to students who have completed PRTM 101 and 102.

302 Camp Organization and Administration 3(2,3) Surveys the development and trends of camping in America. Considers programming for the operations of agency and private camps. Enables students to master the techniques of group living. Laboratory offers practical experience in camp craft including trips and outdoor cooking.

305 Safety in Recreation 3(3,0) Course includes the physiology of exercise as it relates to recreational sports and recreational activities, certification in first aid, and the beneficial effects of recreation. Safety aspects of recreational activities and risk recreation are also covered.

307 Park Maintenance and Operation 3(2,3) Maintenance techniques and materials. Job planning and scheduling problems of overuse and preventive maintenance are included.

308, H308 Leadership and Group Processes in Recreation 3(3,0) Leadership is analyzed through experience-based learning. Various styles of leadership and communication and their probable consequences are examined. Techniques for planning of large and small group meetings are considered. Examination is made of literature in the field of leadership and group processes.

311, H311 Therapeutic Recreation 3(3,0) Examination of the profession of therapeutic recreation by analyzing the history, philosophy, concepts, roles, and functions involved in the therapeutic recreation services.

320, H320 Recreation Policymaking 3(3,0) Structures and processes for public park and/or recreation policy formation in the United States.

321, H321 Recreation Administration 3(3,0) An analysis of the internal organization of a recreation department dealing with finances and accounting, records and reports, publicity and public relations, state and federal legislation, staff organization, coordination of community resources. *Preq:* Junior standing.

330, H330 Introduction to Environmental Interpretation 3(3,0) An introduction to the philosophy and principles of the art of environmental interpretation. A comprehensive survey of interpretive theory as it applies to the recreation and parks practitioner and the varying settings within the profession.

342, H342 Introduction to Tourism 3(3,0) Survey of travel and tourism in the United States with focus on terminology, demographics, financial significance, and trends.

343 Spatial Aspects of Tourist Behavior 3(3,0) Spatial patterns of national and international leisure travel destinations are explored and analyzed regarding their tourism attractiveness.

390 Special Projects in Recreation and Parks 1(1,0) Comprehensive studies and investigation of special topics not covered in other courses. Emphasis will be placed on field studies, community service and independent readings. May be repeated for a maximum of 3 credits. *Preq:* Junior standing and consent of instructor.

400, 600 Supervision of Recreation Personnel Patterns and Processes 3(3,0) A comprehensive study of the supervisory process in relation to individuals, programs, and groups in recreation agencies.

401, 601 World Geography of Recreation and Parks 3(3,0) Major international patterns in the provision and use of urban and rural park and recreation are examined.

402, 602 Campus Recreation 3(3,0) Study of the basic components required for administration of successful College Union and Intramural-Recreation Sport Programs.

403 Elements of Recreation and Park Planning 3(3,0) Basic recreation and park planning principles and processes and trends in area and facility development combine to form the basis for formulation of a relevant knowledge of planning. *Preq:* Senior standing.

405 Field Training in Parks, Recreation, and Tourism Management 8(0,24) The student, in a ten-week program, has the opportunity to observe and be involved with programs in operation. The student will also have responsibilities of organizing and implementing activities and events under supervision within the respective agency. Total of 360 hours required. To be taken Pass/Fail only. *Preq:* PRTM 206 and 207; Senior standing in Parks, Recreation Tourism Management; grade-point ratio equivalent to Clemson University graduation requirement; consent of instructor.

409 Methods of Recreation Research I 3(3,0) An analysis of the principle methods of recreation research, the application of descriptive statistics to recreation research, and the development of a research proposal. *Preq:* Senior standing.

410, H410 Methods of Recreation Research II 3(3,0) A continuation of PRTM 409 to include the supervised execution and reporting of the results of the research proposal developed in PRTM 409 and the application of inferential statistics to recreation research. *Preq:* PRTM 409 or consent of instructor.

411, 611 Therapeutic Recreation for Selected Populations 3(2,3) Therapeutic recreation services for the mentally retarded, aging, and incarcerated populations. Emphasis is directed to planning services appropriate to the needs of clients and to the goals of the various agencies and institutions. *Preq:* PRTM 311 or consent of instructor.

412, 612 Therapeutic Recreation and Mental Health 3(3,0) Therapeutic recreation services in mental health clinics, institutions, and outdoor settings. Review of disorders and current modes of treatment as they relate to therapeutic recreation. *Preq:* PRTM 311 or consent of instructor.

413, 613 Therapeutic Recreation for Physically Disabled 3(2,3) Examination of the potential psychological, physical, and sociological implications of disability to the individual and to the planning and direction of therapeutic recreation services. *Preq:* PRTM 311 or consent of instructor.

414, 614 (ED) Recreation and Leisure for Special Populations 3(3,0) Course designed to provide class participants with practical experience in designing recreation and leisure activities for special populations (e.g., handicapped, elderly).

421, H421, 621 Recreation Financial Resources Management 3(3,0) Analysis of recreation financial resources management. Deals with revenue sources and their allocation. *Preq:* PRTM 321 and Senior standing in Parks, Recreation, and Tourism Management.

431, 631 Methods of Environmental Interpretation 3(2,3) Practice and instruction in the use of equipment and methods available to the interpreter in public contact work. Coaching in presentation and evaluation of live programs and in design, execution, and evaluation of mediated programs will be the major emphasis. Programs will be delivered to public audiences in the Clemson area. *Preq:* PRTM 330; Senior standing in Parks, Recreation, and Tourism Management; or consent of instructor.

432, 632 Historic Site Interpretation 3(3,0) The development and implementation of the specialized interpretive programs required at historic sites. An overview of the historic movement in the United States and its presentation to the American people. *Preq:* PRTM 330.

433, 633 Introduction to Museology 3(2,3) An introduction to the museum concept with insight into current museum practices. Course will include principles and methods of museum practice including conservation/restoration techniques. *Preq:* PRTM 330.

441, 641 Commercial Recreation 3(3,0) Components of offering leisure services and products to the public by individuals, partnerships, and corporations for the purpose of making a profit.

443, 643 Resorts in National and International Tourism 3(3,0) A variety of resort types are studied with respect to their development, organization, visitor characteristics, and environmental consequences. A case-study approach is used.

444, 644 Tour Planning and Operations 3(3,0) Provides the opportunity to understand the psychology of touring, with emphasis on packaged and group tours, and how tours of different types and scale are planned, organized, marketed, and operated. *Preq:* PRTM 342 or consent of instructor.

445, 645 Conference/Convention Planning and Management 3(3,0) Provides the opportunity to understand the problems of and solutions to conference and convention planning and management from both the sponsoring organization and facility manager's perspectives.

446, 646 Community Tourism Development 1-3(1-3,0) Provides a community-based perspective of the organizational, planning, development, funding, and operational needs for a successful tourism economy at the local level. *Preq:* PRTM 342 or consent of instructor.

447, 647 Perspectives on International Travel 3(3,0) Using the U.S. as a destination, international travel patterns and major attractions are presented. Factors which restrain foreign travel to the U.S. are analyzed. *Preq:* Senior standing and reading knowledge of a foreign language or consent of instructor.

703 Seminar in Recreation and Park Administration 3(3,0)

705 Internship 1-3(0,9)

- 706 Computer Assisted Administration in Leisure Services 3(2,3)
- 707 Principles of Environmental Interpretation 3(3,0)
- 708 Selected Topics 1-3(1-3,0)
- 709 Special Problems 1-3(1-3,0)
- 710 Current Issues in Recreation 1(1,0)
- 801 Philosophical Foundations of Recreation and Park Administration 3(3,0)
- 802 Group Processes in Leisure Services 3(3,0)
- 804 Comprehensive Recreation Planning 3(3,0)
- 805 Recreational Aspects of Water Resources 3(3,0)
- 806 Urban Recreation Analysis 3(3,0)
- 807 Theoretical Aspects of Recreation Behavior 3(3,0)
- 811 Research and Evaluation in Recreation 3(3,0)
- 812 Leisure Services for the Elderly 3(3,0)
- 815 Therapeutic Recreation and Activity Therapy Administration 3(3,0)
- 820 Recreation Resource Policy Issues and Processes 3(3,0)
- 840 Tourism Policy 3(3,0)
- 841 Seminar in Exposition Management 3(3,0)
- 891 Master's Research. Credit to be arranged.
- 908 Advanced Topics 1-3(1-3,0)
- 910 Research Seminar 1(1,0)
- 991 Doctoral Research. Credit to be arranged.

PHILOSOPHY (PHIL)

Associate Professors: G. R. Lucas, Jr., W. A. Maker, S. A. Satris; *Assistant Professors:* M. A. Martin, J. L. McCollough, D. E. Wueste

- 101 Introduction to Philosophic Problems 3(3,0)** A discussion of representative philosophical questions which arise from human thought and action. Characteristic topics are as follows: The Conditions of Knowledge; The Nature of Man; The Individual and Society.
- 102 Introduction to Logic 3(3,0)** An introduction to methods of evaluating arguments. Simple valid argument forms are given which can be joined together to produce the logical form of virtually any argument. Informal fallacies may also be considered.
- 103 Introduction to Ethics 3(3,0)** Philosophical consideration of the nature of ethics, basic ethical issues, and problems and modes of ethical reasoning.
- 303 Philosophy of Religion 3(3,0)** A critical consideration of the meaning and justification of religious beliefs. Representative topics are as follows: The Nature and Existence of God; Religious Knowledge; Religious Language; The Problem of Evil.
- 304 Moral Philosophy 3(3,0)** A study of moral problems, their origin in conflicts between duty and desire, and alternative solutions proposed by classical and contemporary writers.
- 315 Roots of Western Philosophy 3(3,0)** The origins and development of rationality as found in the thought of selected philosophers, such as Socrates, Plato, Aristotle, Augustine, and Aquinas.
- 316 Modern Philosophy 3(3,0)** The development of the modern view as seen in major Western philosophers of the 16th, 17th, and 18th centuries. The thought of Descartes, Spinoza, Leibniz, Berkeley, and Hume may be considered to illustrate the development of rationalism and empiricism.
- 317 Nineteenth-Century Philosophy 3(3,0)** The development of 19th-century philosophy with emphasis on selected works of philosophers such as Kant, Hegel, Marx, Nietzsche, and Kierkegaard.
- 318 Contemporary Philosophy 3(3,0)** A study of the dominant movements in Western philosophy today, particularly existentialism and analytical philosophy. The object is to acquire sufficient background for reading current philosophical or philosophically influenced literature.

320 Social and Political Philosophy 3(3,0) A critical consideration of the views of some major philosophers on the nature of man's relation to society and the state in the context of their wider philosophical (logical, epistemological, metaphysical, and ethical) doctrines. Philosophers examined may include Plato, Aristotle, Augustine, Hobbes, Rousseau, Mill, Marx, Hegel, Rawls, and Nozick.

324 Philosophy of Technology 3(3,0) This course will examine technology and representative philosophical assessments of it with a focus on understanding its impact on the human condition.

325 Philosophy of Science 3(3,0) A philosophical study of problems generated by science, but which are not themselves scientific, such as what comprises a scientific theory, how scientists formulate theories and acquire knowledge, what if anything differentiates science from other ways of knowing what role concepts play in scientific knowledge, and whether scientific progress is rational.

343 Philosophy of Law 3(3,0) Explanation of the nature of legal theory and the law through a critical examination of the basic concepts and principles of these fields.

344 Business Ethics 3(3,0) Study of ethical issues created by business activities, relating them to fundamental questions of ethics generally. Representative topics: hiring, firing, promotions, business and minority, organizational influence in private lives, consumer interests, economic justice, and reindustrialization.

345 Environmental Ethics 3(3,0) Study of ethical problems in our dealings with the rest of nature, and of how they relate to ethics in general. Representative topics: the basis of ethics, nature and intrinsic value, duties to future generations, economics and the environment, rare species, animal rights, ethics and agriculture, energy doctrine.

350 (NURS) Technology and Philosophy in Nursing 3(3,0) See NURS 350.

360 Symbolic Logic 3(3,0) Introduction to the basic concepts of modern symbolic logic, including the symbolization of statements and arguments and the techniques of formal proof.

401, 601 Studies in the History of Philosophy 3(3,0) In-depth study of a selected philosopher, philosophical school, or movement. Topics will vary. With departmental consent may be repeated one time for credit. *Preq:* Consent of instructor.

402, 602 Topics in Philosophy 3(3,0) A thorough examination of a particular philosophical topic, issue, or problem. Topics will vary. With departmental consent may be repeated one time for credit. *Preq:* Consent of instructor.

499 Independent Study 1-3(1-3,0) Course of study designed by the student in consultation with a faculty member who agrees to provide guidance, discussion and evaluation of the project. The student must select and confer with the faculty member early enough for their plan to be approved by the department head prior to registration. *Preq:* Consent of instructor.

PHYSICS (PHYS)

Professors: P. B. Burt, W. E. Gettys, H. W. Graben, F. J. Keller, L. L. Larcom, A. L. Lasker, P. J. McNulty, *Head:* J. R. Manson, D. P. Miller, M. G. Miller, J. R. Ray, M. D. Sherrill, M. J. Skove, E. P. Stillwell, Jr., R. C. Turner, C. W. Ulbrich, H. E. Vogel; *Associate Professors:* T. F. Collins, L. M. Duncan, P. J. Flower, J. A. Gilreath, M. F. Larsen, P. A. Steiner, G. X. Tessema; *Assistant Professor:* R. M. Panoff; *Visiting Instructor:* J. T. Isbell

101 Current Topics in Modern Physics 1(0,2) Demonstrations and lectures serving as an introduction to different areas of physics and astronomy will be presented by various members of the staff. These areas may include such topics as astrophysics, energy, relativity, and weather, as well as visits to the planetarium.

122, H122 Physics with Calculus I 3(3,0)¹ The first of three courses in a calculus-based physics sequence. Topics include vectors, laws of motion, conservation principles, rotational motion, oscillations, and gravitation. *Coreq:* MTHSC 108.

124 Physics Laboratory I 1(0,3) Introduction to physical experimentation with emphasis on mechanical systems, including oscillatory motion and resonance. Computers are used in the experimental measurements and in the statistical treatment of data. *Coreq:* PHYS 122.

200 Introductory Physics 4(3,2)¹ Introduction to classical physics. Includes elements of mechanics, heat, electricity, and light. This course may not be substituted for PHYS 122 but may be substituted for PHYS 207, only with the approval of the Department of Physics and Astronomy. *Coreq:* MTHSC 105 or equivalent.

207 General Physics I 4(3,2)¹ Introductory course for students who are not majoring in physical science or engineering. This course covers such topics as mechanics, waves, fluids, and heat. *Coreq:* A course including algebra and trigonometry.

208 General Physics II 4(3,2)² Continuation of PHYS 207. This course covers such topics as electricity, magnetism, electromagnetic waves, optics, and modern physics. *Preq:* PHYS 207.

221, H221 Physics with Calculus II 3(3,0)² Continuation of PHYS 122. Topics include thermodynamics, kinetic theory of gases, electric and magnetic fields, electric currents and circuits, and motions of charged particles in fields. *Preq:* PHYS 122.

222, H222 Physics with Calculus III 3(3,0) Continuation of PHYS 221. Topics include wave motion, electromagnetic waves, interference and diffraction, relativity, atomic particles, and atomic and nuclear structure. *Preq:* PHYS 221.

223 Physics Laboratory II 1(0,3) Experiments in heat and thermodynamics, electrostatics, circuits, and magnetism. Computers are used in the statistical treatment of data. *Coreq:* PHYS 221.

224 Physics Laboratory III 1(0,3) Experiments involve atomic, molecular, and nuclear systems. The wave particle dualism of light and matter is emphasized. Calculators and computers are used in statistical treatment of data. *Coreq:* PHYS 222.

240 Physics of the Weather 3(3,0) A descriptive introduction to meteorology. Includes atmospheric thermodynamics, solar radiation, heat budget, atmospheric circulation, force laws governing air motion, fronts, precipitation, synoptic prediction. Special topics of current interest such as the effect of environmental pollution of weather, and the effect of weather on health are included.

245 Energy Sources for the Future 3(3,0) A study of possible sources of energy including fossil fuels, solar energy, nuclear energy, and their uses. The basic physical concepts, the economic feasibility, and environmental impact of the use of these sources of energy are discussed. *Preq:* One semester of a physical science.

262 Physics of Music 3(3,0) An elementary, nontechnical study of the relationship between the laws of physics and the production of music for the music student or layman who wishes to understand the physical principles of the art. Topics include mechanical and acoustical laws, harmonic analysis, musical scales, sound production in instruments, physiology of hearing, etc.

290 Physics Research 1-3(0,3-9) This individual research project may be performed in any area of experimental or theoretical physics or astronomy. Work will be performed under the supervision of a physics or astronomy faculty member. Project need not be original but must add to the student's ability to carry out research. May be repeated to a maximum of 6 credits. *Preq:* Consent of instructor and minimum GPR of 3.0.

321, H321, 621 Mechanics I 3(3,0) Statics, motions of particles and rigid bodies, vibratory motion, gravitation, properties of matter, flow of fluids. *Preq:* PHYS 221.

322, H322, 622 Mechanics II 3(3,0) Dynamics of particles and rigid bodies, Lagrangian and Hamiltonian formulations, vibrations of strings, wave propagation. *Preq:* PHYS 321 or consent of instructor.

325, H325, 625 Experimental Physics I 3(1,4) Introduction to experimental modern physics, measurement of fundamental constants, repetition of crucial experiments of modern physics (Stern-Gerlach, Zeeman effect, photoelectric effect, etc.). *Coreq:* PHYS 321 or consent of instructor.

326, H326, 626 Experimental Physics II 3(1,4) Continuation of PHYS 325.

340 (ECE) Electromagnetics I 2(2,0) See ECE 340.

341, H341 (ECE) Electromagnetics II 2(2,0) See ECE 341.

¹Credit for a degree will be given for only one of the following courses: PHYS 122, 200, 207.

²Credit for a degree will be given for only one of the following courses: PHYS 208, 221.

401 Senior Thesis I 1-3 A semioriginal project performed under the direction of a physics staff member. Theoretical fields available include relativity, solid state, statistical mechanics, nuclear physics, and astrophysics. Experimental work may be done in various areas of solid-state physics, astronomy, biophysics, and atmospheric physics. *Preq:* Three physics courses beyond introductory physics.

402 Senior Thesis II 1-3 Continuation of PHYS 401.

417, H417, 617 Introduction to Biophysics I 3(3,0) Introduction to the application of physics to biological problems. Topics include a review of elementary chemical and biological principles, physics of biological molecules, and fundamentals of radiation biophysics. *Preq:* MTHSC 206, PHYS 221, or consent of instructor.

418, H418, 618 Introduction to Biophysics II 3(3,0) Continuation of PHYS 417. Further work in radiation biophysics, cell population kinetics, and selected special topics such as membrane biophysics, control theory and molecular biophysics, muscle studies, irreversible thermodynamics in biophysics, enzyme physics, etc. *Preq:* MTHSC 206, PHYS 221, or consent of instructor.

420, 620 Atmospheric Physics 3(3,0) A study of the physical processes governing atmospheric phenomena. Topics include thermodynamics of dry and moist air, solar and terrestrial radiative processes, convection and cloud physics, precipitation processes, hydrodynamic equations of motion and large-scale motion of the atmosphere, numerical weather prediction, atmospheric electricity. *Preq:* MTHSC 108, PHYS 208 or 221.

427, 627 Instrumentation in Experimental Physics 3(2,2) Designed to introduce the student to the instrumentation techniques involved in physics research, including the interfacing of microcomputers to experimental equipment. Data acquisition and storage and the signal conditioning to accomplish these tasks are presented in a planned sequence. *Preq:* PHYS 221 and 223, or consent of instructor.

432, H432, 632 Optics 3(3,0) This course covers a selection of topics, depending on the interest of the student. Topics covered may include the formation of images by lenses and mirrors, design of optical instruments, electromagnetic wave propagation, interference, diffraction, optical activity, lasers, and holography. *Preq:* PHYS 221.

442, H442, 642 Electromagnetic Theory 3(3,0) A study of the foundations of electromagnetic theory. Topics include electrostatics, dielectrics, magnetostatics, magnetic materials, Maxwell's equations, relativity, and electrodynamics. *Preq:* ECE (PHYS) 341 or consent of instructor.

446, H446, 646 Solid State Physics 3(3,0) An introductory treatment of the crystal structure of solids and the properties of solids which depend on crystal structure, free electron model of metals, band theory of solids, Brillouin zones, crystalline defects and diffusion. *Preq:* PHYS 222 or consent of instructor.

452, H452, 652 Nuclear and Particle Physics 3(3,0) A study of our present knowledge concerning subatomic matter. The experimental results are stressed. Topics discussed include particle spectra, detection techniques, Regge pole analysis, quark models, proton structure, nuclear structure, scattering and reactions.

455, H455, 655 Quantum Physics I 3(3,0) Discussion of solution of the Schrodinger equation for free particles, the hydrogen atom and the harmonic oscillator. *Preq:* PHYS 322 and ECE (PHYS) 341, or consent of instructor.

456, H456, 656 Quantum Physics II 3(3,0) Continuation of PHYS 455. Application of principles of quantum mechanics as developed in PHYS 455 to atomic, molecular, solid state and nuclear systems. *Preq:* PHYS 455.

457, H457, 657 Basic Health and Radiological Physics I 3(3,0) Topics discussed in this course include a survey of nuclear physics, interaction of radiation with matter, biological effects of high and low energy radiation, and uses of radiation for therapy and diagnosis. *Preq:* PHYS 321, ECE (PHYS) 341, or consent of instructor.

458, H458, 658 Basic Health and Radiological Physics II 3(3,0) Continuation of PHYS 457. Topics covered will include dosimetry and radiation protection, ultraviolet radiation effects, shielding calculations, thermal effects, tracer use and kinetics, and ultrasonics. *Preq:* PHYS 457 or equivalent.

460, H460, 660 Contemporary Physics for High School Teachers 3(3,0) Study of later developments including the measurements of atomic particles. The formulation of new laws and the modifications of old ideas needed to describe the interactions of these particles. *Preq:* One year of General Physics or consent of instructor.

465, H465, 665 Thermodynamics and Statistical Mechanics 3(3,0) Study of temperature, development of the laws of thermodynamics and their application to thermodynamic systems. An introduction to low temperature physics is given. *Preq:* Six hours of physics beyond PHYS 222 or consent of instructor.

473, H473, 673 X-Ray Crystallography 3(2,3) Study of crystal symmetry, elementary group theory, X-ray diffraction by crystals. Experimental methods of goniometry, powder and single crystal diffraction are used to determine structures and electron density distribution. Application of X-ray diffraction to chemical, physical, and metallurgical problems.

475, 675 Special Topics in Physics 1-3(0-3,0-9) Comprehensive study of a topic of current interest in the field of physics. May be taken for credit more than one time. *Preq:* Consent of instructor.

703 Modern Physics for High School Teachers 3(3,0)

711 Origins of Physical Science 3(3,0)

716 Experimental Physics for High School Teachers 4(2,4)

720 Earth Science III: Meteorology and Oceanography for Science Teachers 3(3,0)

721 Earth Science IV: Special Topics in Meteorology for Science Teachers 1(0,2)

723 Weather Science for Science Teachers 3(3,0)

731 Physics for Advanced Placement Teachers 3(2,2)

775 Physics Topics for Teachers 1-3(0-3,0-6)

811 Methods of Theoretical Physics I 3(3,0)

812 Methods of Theoretical Physics II 3(3,0)

815 (ME) Statistical Thermodynamics I 3(3,0)

816 Statistical Thermodynamics II 3(3,0)

817 Advanced Statistical Mechanics 3(3,0)

821 Classical Mechanics I 3(3,0)

822 Classical Mechanics II 3(3,0)

841 Electrodynamics I 3(3,0)

842 Electrodynamics II 3(3,0)

845 Solid State Physics I 3(3,0)

846 Solid State Physics II 3(3,0)

875 Seminar in Contemporary Physics 1-3(1-3,0)

890 Directed Activities in Applied Physics 1-6

891 Master's Research. Credit to be arranged.

951 Quantum Mechanics I 3(3,0)

952 Quantum Mechanics II 3(3,0)

966 Relativity 3(3,0)

971 Advanced Quantum Theory I 3(3,0)

972 Advanced Quantum Theory II 3(3,0)

991 Doctoral Research. Credit to be arranged.

PLANT PATHOLOGY (PLPA)

Professors: O. W. Barnett, Jr., L. W. Baxter, N. D. Camper, G. E. Carter, Jr., O. J. Dickerson, *Head:* G. C. Kingsland, S. A. Lewis, E. I. Zehr; *Assistant Professor:* D. A. Kluepfel

101 Introduction to Plant Diseases 2(2,0) Introduction to diseases of plants, their causes, methods of spread, development in plants, effects on plants, and impact on mankind.

102 Introduction to Plant Pathology Research 1-3(0,3-9) Introduction to research by participation in a plant pathology research project. The student will be guided in preparation of a proposal, completion of its objectives, interpretation of data, and composition of a final report. To be taken Pass/Fail. *Preq:* PLPA 101 or consent of instructor.

301, H301 Plant Pathology 3(2,2) Principles of the interrelationships between plant pathogens, their hosts, and the environment. Economically important plant diseases are used to illustrate these principles and the application of these principles to disease control. *Preq:* BIOL 103 and 105 or 110.

302 Plant Pathology Research 1-3(0,3-9) Research experience in a plant pathology research project for an undergraduate who understands basic concepts of research. Students will develop research objectives, procedures, and collect data. A written report will include interpretation of results. To be taken Pass/Fail. *Preq:* PLPA 301 or consent of instructor.

411, 611 Plant Disease Diagnosis I 2(1,2)SS, Odd-numbered years. Methods and procedures used in the diagnosis of plant diseases, especially late spring and early-summer diseases. Basic techniques of pure culture and identification of plant pathogens and Koch's postulates will be taught. Diagnosis of a wide variety of diseases of cultivated and wild plants will be carried out. *Preq:* PLPA 301 or equivalent.

412, 612 Plant Disease Diagnosis II 2(1,2)SS, Even-numbered years. Methods and procedures used in the diagnosis of plant diseases, especially late-summer diseases. Basic techniques of pure culture and identification of plant pathogens and Koch's postulates will be taught. Diagnosis of a wide variety of diseases of wild and cultivated plants. *Preq:* PLPA 301 or equivalent.

451, 651 Bacterial Plant Pathogens 3(2,3)S, Odd-numbered years. The nature, development, and control of plant diseases caused by bacteria. Taxonomic considerations, host-parasite relations and techniques used in isolating, identifying, and preserving bacterial plant pathogens. *Preq:* MICRO 305, PLPA 301, or consent of instructor.

456, H456, 656 Plant Virology 3(2,3)S, Even-numbered years. Plant viruses with emphasis on their morphology, biochemistry, purification and transmission; symptoms resulting from virus infection; virus-vector relationships; and serological procedures. The importance and control of plant virus diseases will be discussed. *Preq:* BIOL 103 and 105 and any biochemistry or plant physiology course.

458, H458, 658 Plant Parasitic Nematodes 3(2,3)F, Odd-numbered years. Morphology and taxonomy of stylet-bearing nematodes and their relationship with plant diseases. *Preq:* BIOL 103, 104, 105, 106 or 110, 111.

800 Advanced Plant Pathology 3(3,0)

801 Epidemiology and Control of Plant Disease 3(3,0)

802 Special Topics in Plant Pathology 1(1,0)

803 Fungal Plant Pathogens 3(1,6)

804 Physiological Plant Pathology 3(3,0)

805 Special Problems in Plant Pathology 1-3

807 Seminar 1(1,0)

808 Techniques and Methods in Plant Pathology 1(0,3)

809 Physiological Techniques in Plant Pathology 2(1,3)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

PLANT PHYSIOLOGY (PLPH)

991 Doctoral Research. Credit to be arranged.

POLITICAL SCIENCE (POSC)

Professors: H. E. Albert, E. M. Coulter, C. W. Dunn, *Head*; M. A. Morris, W. H. Owens, Jr., M. W. Slann; *Associate Professors:* S. H. Wainscott, J. D. Woodard; *Assistant Professor:* W. Lasser; *Visiting Instructor:* J. J. Lamb; *Adjunct Professors:* E. E. Morris, Jr., J. S. Thurmond; *Adjunct Assistant Professor:* P. McGregor

101 Introduction to American Politics 3(3,0) Introduction to American National Government and politics with an emphasis on the functions of governmental organizations, the behavior of political parties and personalities, and the role of public opinion.

201 Introduction to Government and Politics 3(3,0) A basic introduction to the study, analysis, scope, and sources of government. Emphasis is given to the comparative institutions of government, the international relations of government, the theoretical conceptions man has entertained about government, and analysis of the ways in which man has behaved in response to government.

302 State and Local Government 3(3,0) The structural features, functions, and legislative, executive and judicial processes of American state and local government.

310 Special Activities 1-3(1-3,0) Course encompasses special projects, approved by the department head, which involve students in research, simulation, internships, or other actions requiring the study and application of political principles, and which are engaged in for at least one semester or its equivalent.

311 Model United Nations 1(0,1) Participation in United Nations simulation exercises, in competition with other colleges and universities.

312 State Student Legislature 1(0,1) Participation in state student legislature simulation exercises, in competition with other colleges and universities in the State.

321 General Public Administration 3(3,0) Introduction to public administration including the elements of organization, personnel and financial management, administrative law, and administrative responsibility. *Preq:* POSC 101, Junior standing, or consent of instructor.

341 Political Science Methodology 3(2,1) Introduction to political science methodology. Examination of the different research settings and various techniques for collecting political data. A critical review of the contemporary literature of political science. Laboratory training and fieldwork in interviewing. Includes exercises in computer use for elementary quantitative analysis of political data. *Preq:* MTHSC 101 and POSC 101 or equivalent or consent of the instructor.

351 Classical Political Thought 3(3,0) Political philosophy from the pre-Socratic period to Machiavelli. *Preq:* POSC 201, Junior standing, or consent of instructor.

352 Modern Political Thought 3(3,0) The early theories of the nation state in the 16th century and the major political thinkers, problems and movements through the 20th century. *Preq:* POSC 201, Junior standing, or consent of instructor.

361 International Politics 3(3,0) Introduction to foreign policy, international law, and international organizations. *Preq:* POSC 201, Junior standing, or consent of instructor

371 Comparative European Politics 3(3,0) Major emphasis on the United Kingdom, France, Germany, and the U.S.S.R., with brief attention given to Italy and Switzerland. Current methods of comparison will be studied and applied to the formal and informal functioning of these governments. *Preq:* POSC 201, Junior standing, or consent of instructor.

373 Third World Politics 3(3,0) Survey of policies and problems of development of Third World states and their implications for the United States. *Preq:* POSC 201, Junior standing, or consent of instructor.

379 Directed Study in Comparative and International Politics 3(3,0) Readings and research in comparative government and society and international affairs. *Preq:* Consent of instructor.

H390 Junior Honors Research 1(1,0) Readings and research in conjunction with an approved political science course at the 300 or 400 level. Honors status required.

403 Congressional Politics 3(3,0) Examination of the behavior and processes of decision making in the American Congress together with an analysis of the interaction among Congress and the executive and judicial branches of the national government. *Preq:* POSC 101, Junior standing, or consent of instructor.

405 Presidential Leadership 3(3,0) Examination of the organizational patterns, administrative behavior, and political forces in the Presidency with considerable emphasis on relations between the Presidency and Congress, the courts, and administrative regulatory agencies. *Preq:* POSC 101, Junior standing, or consent of instructor.

407 Religion and American Politics 3(3,0) Examination of the impact of religion on American politics, including an analysis of the role of religion in politics, political behavior of major religious groups, constitutional issues and voting behavior. *Preq:* POSC 101 or consent of instructor.

408 Topics in American Government 3(3,0) Examination of selected themes and/or issues in an area of American government, public policy, or public law. May be repeated once for credit. *Preq:* POSC 101 or consent of instructor.

409, 609 Directed Study in American Institutions 3(3,0) Supervised reading and/or research in selected areas of American government. *Preq:* Twelve semester hours in political science and consent of instructor.

422, 622 Government Policy and Political Economy 3(3,0) Focuses on the roots and development of American political economy. Attention is given to the way in which economic factors affect American politics and the ability to govern. *Preq:* POSC 101; Junior standing or consent of instructor.

423, 623 Urban Politics 3(3,0) Interaction of political, technical, and administrative processes in urban America. Special emphasis is given to the history and future of urban areas. *Preq:* POSC 101, Junior standing, or consent of instructor.

425, 625 Money, Budgets and Grantsmanship 3(3,0) Examination of governmental budgeting structures and processes. A hands-on approach working with a city's past and present budget and producing next year's budget. Writing a grant proposal optional for undergraduates, required for graduate students. *Preq:* POSC 101, Junior standing, or consent of instructor.

427, 627 Public Personnel Management 3(3,0) Government personnel systems; current trends and problems; essentials of recruitment, classification, compensation, motivation, evaluation, training, and discipline. *Preq:* POSC 101, Junior standing, or consent of instructor.

428, 628 National Security Policy 3(3,0) A study of the problems in formulating policies of national defense, examination of alternatives, consequences and effectiveness of current techniques in nuclear weaponry, guerrilla and conventional warfare. *Preq:* POSC 101, Junior standing, or consent of instructor.

432 American Constitutional Law I 3(3,0) A brief introduction to the judicial process followed by a detailed examination of leading cases pertaining to the judiciary, the Congress, the Presidency, and the federal system. *Preq:* POSC 101, Junior standing, or consent of instructor.

433, 633 American Constitutional Law II 3(3,0) Examination of the relationship of the individual to his government, focusing on the safeguards of liberty and property including freedoms of speech, press and religion, and criminal procedures. *Preq:* POSC 101, Junior standing, or consent of instructor.

434 Law, Courts, and Politics 3(3,0) Introduction to the role of law, judges, and courts in the American political system, focusing on the nature of the legal system; legal methods; the role of courts in statutory construction and in the administrative process; and judicial activism and restraint. *Preq:* POSC 101, Junior standing, or consent of instructor.

435 Criminal Law 3(3,0) Examination of the criminal justice system with special emphasis on the constitutional requirements for criminal procedure, and on the relationship between legal theory and practice in the criminal justice area. *Preq:* POSC 101, Junior standing, or consent of instructor.

442, 642 Political Parties and Elections 3(3,0) Study of the distinctive features of the American two-party system with emphasis on presidential elections. Parties are examined as formal organizations, coalitions of voters and interest groups, coordinators of nomination and election processes, and managers of policy-making institutions. *Preq:* POSC 101, Junior standing, or consent of instructor.

443 The Mass Media in Politics 3(3,0) Course examines the nature of public opinion, its social and political context, the social-psychological processes basic to it, the dynamics of its formation and change and its measurements. *Preq:* POSC 101, Junior standing, or consent of instructor.

448 Campaign Strategy and Tactics 3(3,0) Practical introduction to the planning and execution of a political campaign, designed for candidate, manager and others who play key roles in a campaign. Covers the use of pertinent data, targeting, issues, organization, use of the media, direct mail, finance, etc. Includes application of those aspects to a campaign. *Preq:* POSC 101, Junior standing, or consent of instructor.

- 453 American Political Thought 3(3,0)** American political philosophy from the seventeenth century to the present with an emphasis on political and social developments since the 1770s. *Preq:* POSC 101, Junior standing, or consent of instructor.
- 454 Southern Politics 3(3,0)** Southern politics since 1950 with emphasis upon the characteristics of sectional politics, decline of the one-party system, impact of desegregation and civil rights activism, political resurgence of the South in the 1970s and its impact on national politics. *Preq:* POSC 101, Junior standing, or consent of instructor.
- 457, 657 Political Terrorism 3(3,0)** Examination and analysis of the international phenomenon of terrorism in terms of origins, operations, philosophy, and objectives. *Preq:* POSC 201, Junior standing, or consent of instructor.
- 462, 662 Peace and Order in International Relations 3(3,0)** Survey of obstacles to and advances in law and order in international relations. *Preq:* POSC 201, Junior standing, or consent of instructor.
- 463 United States Foreign Policy 3(3,0)** Focus on foreign policy in its historical perspective, examining the decision-making process in foreign policy; evaluates contemporary American capabilities, and analyzes specific issues. *Preq:* POSC 201, Junior standing, or consent of instructor.
- 465 Foreign Policies of the Major Powers 3(3,0)** Study in the foreign policies of the leading world powers with special reference to the geographic, economic, historical and political determinants of each. A general introduction to the field of foreign policy. United States foreign policy is not emphasized. *Preq:* POSC 201, Junior standing, or consent of instructor.
- 468 Topics in International/Comparative Politics 3(3,0)** Examination of selected themes and/or issues in an area of international relations or comparative politics. May be repeated once for credit. *Preq:* POSC 101 or consent of instructor.
- 471 Politics of the Soviet Union 3(3,0)** Examination and analysis of the Soviet Union's political process, its evolution as a communist society, and the overall direction of its international status as a superpower. Attention is also given to political and nationalist division. *Preq:* POSC 201, Junior standing, or consent of instructor.
- 472 Japan and East Asia: Politics, Government, and Foreign Policy 3(3,0)** Survey of Japanese politics, government, economy, and foreign policy, primarily in East Asia. *Preq:* POSC 201, Junior standing, or consent of instructor.
- 475 Political Systems of Latin America 3(3,0)** Examination of political processes in Latin America from both institutional and national perspectives. *Preq:* POSC 201, Junior standing, or consent of instructor.
- 476 Politics of the Middle East 3(3,0)** Comparative examination of the political processes of the Middle East, emphasizing a socio-cultural approach to the problems of political development. Overview of the course concentrates upon the Arab and non-Arab states of Jordan, Lebanon, Syria, the United Arab Republic, Iran, Israel, and Turkey. *Preq:* POSC 201, Junior standing, or consent of instructor.
- 482 The Political Novel and the Cinema 3(3,1)** Consideration of how political science is treated in political novels and cinema, and how political opinions are shaped by these media. *Preq:* POSC 101, 201, Junior standing, or consent of instructor.
- H490 Senior Honors Thesis Research 3(3,0)** Reading and research related to the senior honors thesis.
- H491 Senior Honors Thesis 3(3,0)** Research and writing of the senior honors thesis.

POULTRY SCIENCE (PS)

Professors: G. P. Birrenkott, Jr., J. W. Dick, B. Glick, *Head*; B. L. Hughes, J. E. Jones, R. J. Thurston; *Associate Professor:* D. V. Maurice; *Assistant Professor:* T. R. Scott

101 Avian Pets—Biology and Owner Responsibilities 1(1,0)F Systematic coverage of the many types of birds that humans keep as social companions. The nutrition, environmental considerations, reproductive habits, health, legal and economic aspects of these pets will be considered.

201 Poultry Husbandry 3(3,0)F A study of the principles of poultry production and marketing and of the anatomy and physiology of the economically important poultry and game bird species. *Preq:* Consent of instructor.

323 Poultry and Poultry Products Evaluation 2(0,4) Selection of layers, broilers, and turkeys. Grading of poultry products according to USDA grade standards will also be studied. Students enrolled in this course are eligible to compete in Intercollegiate Poultry Judging Contests. *Preq:* PS 201 or consent of instructor.

355, 655 Poultry Products Grading and Technology 3(2,3)S, Odd-numbered years. Factors important in the quality of poultry products are considered. The effects of production, handling, packaging and storage on consumer acceptability are discussed. Quality evaluation will be considered from the standpoint of tenderness, flavor, microbiology, and USDA grades.

400, 600 Avian Physiology 3(3,0)S Even-numbered years. Detailed study of the structure and function of organ systems of avian species with emphasis on digestion and reproduction. Students are given an opportunity to study organ system(s) of their choice using quantitative physiological techniques. *Preq:* ANPH 301, PS 201, or consent of instructor.

402, 602 Poultry Management 3(3,0)S Odd-numbered years. A continuation of PS 201 which emphasizes management, decision-making and the application of technology to the commercial production of poultry and poultry products. *Preq:* PS 201 or consent of instructor.

403, 603 Poultry Management Laboratory 1(0,3) Companion laboratory with PS 402 which emphasizes problem solving, decision-making exercises, and familiarization with commercial poultry operations. *Preq:* PS 201 and registration in 402, or consent of instructor.

405, 605 Special Topics 1-4(1-3,0-3) Topics of interest to the student at undergraduate, graduate, and professional levels. Course is designed to give experience with avian problems not covered in other courses or on thesis research. Cumulative maximum of 4 credits. *Preq:* Consent of instructor.

406, 606 Special Problems 1-3(0,3-9) Research problems of special interest to the student. Course is designed to give laboratory experience and concentrated study in an area not covered in depth in other courses. Cumulative maximum of 3 credits. *Preq:* Consent of instructor.

451, 651 Poultry Nutrition 2(2,0)F, Odd-numbered years. The nutrient requirements of chickens, turkeys, and game birds and methods of determining these requirements are discussed. Deficiencies and excesses of vitamins and minerals and the effects of naturally occurring toxins are considered. Hand formulation and linear programming are introduced.

453, 653 Poultry Nutrition Laboratory 1(0,3) Course to impart training in basic laboratory skills and to familiarize students with common laboratory methods used in poultry nutrition.

454, 654 Least Cost Feed Formulation 1(0,2)S, Even-numbered years. Study of least-cost formulation of animal diets. Encompasses development of ingredient composition tables, nutrient specifications, along with formulation evaluation. Linear programming and computers are used. *Preq:* NUTR 201, 401, or PS 451.

458, 658 Avian Microbiology and Parasitology 4(3,3)F, Even-numbered years. Agents causing poultry diseases; the diagnosis, prevention, and treatment of specific diseases and their economic and public health significance.

460, 660 Seminar 1(1,0) Current research reported in journals covering the various areas of avian science. Students practice interpretation of technical material for laymen. *Preq:* Consent of instructor.

471 Practicum 1-4(0,2-9) Practical, supervised experience in an approved commercial organization dealing with poultry production, processing, or distribution. The student will submit monthly reports during the practicum and will conduct a departmental seminar at its conclusion. *Preq:* Junior standing and consent of instructor.

804 Poultry Pathology 3(1,6)

805 Seminar 1(1,0)

825 Immunobiology 3(3,0)

891 Master's Research. Credit to be arranged.

PSYCHOLOGY (PSYCH)

Professors: L. Berger, S. N. Cole, J. D. Davenport, E. H. Galluscio, *Head*; R. H. Nowaczyk, N. R. Schultz, Jr.; *Associate Professors:* E. G. Brainerd, Jr., W. J. Burroughs, D. D. Moore, L. I. Park, D. J. Senn; *Assistant Professors:* T. R. Alley, P. A. Connor-Greene, B. P. Goettl, J. S. Schippmann, B. R. Stephens, F. S. Switzer III, J. G. Williams; *Visiting Assistant Professors:* J. K. Banks, P. A. Knowles

101 Orientation to Psychology 2(2,0) General orientation to psychology as a profession, to areas of study within the discipline, and to career-planning strategies. Application of psychological theories, principles, and methods to everyday life. Open only to new Psychology majors who have not taken PSYCH 201.

201, H201 Introduction to Psychology 3(3,0) Introduction to the study of behavior. Analysis of the biological bases of behavior, learning, thinking, motivation, perception, human development, social behavior, and the application of basic principles to more complex phenomena such as education, personal adjustment, and interpersonal relations.

205 Research Methods and Measurement 3(3,0) Survey of research designs used in psychology with emphasis on designs other than experimental designs. Topics include attitude measurement, scaling techniques, field and observational research, and questionnaire construction. *Preq:* PSYCH 201.

210, H210 Introductory Experimental Psychology 4(3,3) Introduction to data analysis of experimental and correlational research in psychology. Emphasis is placed on the applications and logical nature of statistical reasoning. Laboratory periods stress the techniques of data analysis including analysis using microcomputers. *Preq:* PSYCH 201 or consent of instructor.

301 Applied Psychology 3(3,0) Course emphasizes the application of theories and research to the solution of problems in the community and work place. The contributions of psychology to business and industrial settings, community settings and educational settings are considered. *Preq:* PSYCH 201.

303 Psychology of Adjustment 3(3,0) Course in personal adjustment dealing with appropriate and inappropriate reactions to stress, frustration, and conflict. Consideration is given to practical coping skills and techniques for managing emotions, changing one's own behavior, and improving interpersonal relationships. *Preq:* PSYCH 201 or consent of instructor.

306 Human Sexual Behavior 3(3,0) The subject of sexual behavior is to be approached from the psychophysiological, behavioral, and cultural points of view. Evolutionary, historical, and cross-cultural perspectives will be considered.

308 Women and Psychology 3(3,0) Explores the wide variety of psychological issues that concern women. Empirical research on topics such as motherhood, sex differentiation, motivation, and psychological disorders will be emphasized. *Preq:* PSYCH 201.

310 Advanced Experimental Psychology 4(3,3) Continuation of PSYCH 210 with an emphasis on conducting original research in the scientific study of human and animal behavior. Laboratory periods stress the refinement of techniques and the execution of research in a guided setting. *Preq:* PSYCH 201, 210, or achievement of a satisfactory score on the departmental competency examination.

320 Principles of Behavior 3(3,0) Study of basic learning principles including classical conditioning, operant conditioning, and modeling. Initial emphasis is on animal studies followed by human applications and techniques. *Preq:* PSYCH 201, 210.

321 Principles of Behavior Laboratory 1(0,3) Laboratory work will include animal handling and training and applications of techniques from PSYCH 320. *Coreq:* PSYCH 320.

330 Motivation 3(3,0) Various aspects of motivation are considered by studying physiological, emotional, and environmental influences on behavior. The orientation is empirical rather than theoretical with emphasis on pertinent research, applications, and measurement of motives. *Preq:* PSYCH 201.

333 Cognitive Psychology 3(3,0) Study of higher-order mental processing in humans. Topics include memory, learning of concepts, problem solving, and the psychology of language. *Preq:* PSYCH 201.

334 Laboratory in Cognitive Psychology 1(0,3) Selected experiments and demonstrations are conducted to reveal phenomena related to human perception, memory, reasoning, problem solving, and high-level mental processes. *Preq:* PSYCH 201 and 205 or 210 or consent of instructor. *Coreq:* PSYCH 333.

340 Life-Span Developmental Psychology 3(3,0) A survey of current theory and research concerned with the psychological aspects of human growth and development across the entire life span. Major topics include developmental methods, physical maturation, cognition, socialization, personality, psycholinguistics, intelligence, learning, behavior problems, and exceptionality. *Preq:* PSYCH 201.

343 Psychological Development from Conception to Adolescence 3(3,0) Emergence, growth, and change of behavior from conception to adolescence. Special consideration is given to the study of methodology and the beginning of sensory/perceptual abilities, intellectual capacities, language, social skills, and personality. *Preq:* PSYCH 201.

344 Psychology of Adolescence 3(3,0) Study of the psychosocial processes of adolescence. Major emphasis is on personality development, growth of thinking, social and sexual maturation, and variations in adolescence. *Preq:* PSYCH 201.

345 Adulthood and Aging 3(3,0) Special consideration of the major psychological processes of aging as they relate to individual behavior and adaptation. Included are the influences of aging on the body, learning and psychomotor skills, thinking and intelligence, employment and productivity, personality, and psychopathology. Opportunity for contact with institutionalized and noninstitutionalized elderly persons is provided. *Preq:* PSYCH 201.

352 Social Psychology 3(3,0) A survey course analyzing human social behavior from the perspective of the individual as a participant in social relationships. The major emphasis is on the study of such contemporary social processes as attitude formation and change, interpersonal relations, conformity, conflict resolution, aggression and violence, social communication, and group phenomena. *Preq:* PSYCH 201.

355 Environmental Psychology 3(3,0) Consideration of the influences of the physical environment on human behavior. Topics include perception of and adaptation to the environment, effects of physical design on behavior, and individual reactions to environmental stressors. *Preq:* PSYCH 201 or consent of instructor.

364 Industrial Psychology 3(3,0) Reviews the perception of work from the preindustrial revolution to the present. Comparative approaches to motivation, development, maintenance, and attraction of successful work behaviors are discussed. Topics include the organization's responsibilities to the community, implementing a disease- and accident-free workplace, and the effects of consumerism. *Preq:* PSYCH 201.

368 Organizational Psychology 3(3,0) Analysis of individual behavior for the purpose of investigating problems in organizations and increase organization effectiveness. Topics include psychological factors affecting communication, decision making, conflict, leadership, work stress, power, and organizational change. *Preq:* PSYCH 201.

370 Personality 3(3,0) Introduction to the area of personality theory emphasizing psychoanalytic, behavioral, and humanistic approaches. Applications of personality theories to such topics as development and adjustment are considered and research implications are evaluated. *Preq:* PSYCH 201.

397 Skills in Human Relations 3(3,0) Application of the concepts of psychology to both individual and professional behavior. A practical course which emphasizes training in human-relations skills and improving the individual's ability to relate to other persons, particularly in psychological services and professions. *Preq:* PSYCH 201 or consent of instructor.

415, 615 Systems and Theories of Psychology 3(3,0) Study of the development of psychology particularly during the past 100 years. Emphasis on giving the student a better perspective of present-day psychology. The focus is on the various approaches taken by influential psychologists and the conflicts among these approaches. *Preq:* PSYCH 201 and one 300-level psychology course or consent of instructor.

422 Sensation and Perception 3(3,0) Study of psychophysical techniques of measurement and sensory and perceptual processes related to vision, hearing, and the other senses. *Preq:* PSYCH 201, and one 300-level psychology course or consent of instructor.

423 Sensation and Perception Laboratory 1(0,3) Selected experiments are conducted to demonstrate the phenomena involved in sensation and perception. *Preq:* PSYCH 205 or 210 or consent of instructor. *Coreq:* PSYCH 422.

424, 624 Physiological Psychology 3(3,0) Study of human neuroanatomy with emphasis on the function of the nervous and endocrine systems. Discusses the biological basis of behavior in its normal and abnormal dimensions. *Preq:* PSYCH 201 and one 300-level psychology course or consent of instructor.

425, 625 Physiological Psychology Laboratory 1(0,3) Demonstrations and techniques of selected physiological procedures are presented to explain the principles discussed in PSYCH 424. *Coreq:* PSYCH 424.

435, 635 Human Factors Psychology 3(3,0) Analyses of theoretical issues and research methods pertaining to the interaction between people and machines and human performance. Topics include information processing theory, human control systems and displays, task simulation, perceptual and motor factors limiting human performance. *Preq:* PSYCH 201, and one 300-level psychology course or consent of instructor.

459, 659 Group Dynamics 3(3,0) Review of current theory and research on small-group processes with special emphasis given to group formation and development, group structure, the dynamic forces within a group, leadership, and group problem solving and decision making. *Preq:* PSYCH 201 and one 300-level psychology course or consent of instructor.

470, 670 Theories of Personality 3(3,0) Analysis of classical and contemporary theories of personality including Freudian, neo-Freudian, behavioristic, humanistic, and existentialistic theories. *Preq:* PSYCH 201 and one 300-level psychology course or consent of instructor.

471, 671 Psychological Testing 3(3,0) Introduction to the theory of psychological testing emphasizing the principles of measurement and psychometric characteristics of a good psychological test. Issues in test development, administration, and interpretation are reviewed. Educational, industrial, and clinical uses of tests are examined. *Preq:* PSYCH 201 and 210 or consent of instructor.

480, 680 Health Psychology 3(3,0) Study of the role of health-related behaviors in the prevention, development and/or exacerbation of health problems. Emphasis on the biopsychosocial model and its application in the assessment, treatment, and prevention of health problems. *Preq:* PSYCH 201, one 300-level psychology course or consent of instructor.

483, 683 Abnormal Psychology 3(3,0) Study of the physiological, psychological, and cultural factors involved in such behavioral disorders as transient situational disturbances, personality disorders, psychoneuroses, psychoses, and psychosomatic disturbances. Special emphasis is placed on the advantages and disadvantages of particular conceptual models in labeling and describing behaviors as either normal or abnormal. *Preq:* PSYCH 201 and one 300-level psychology course or consent of instructor.

488 Theories of Psychotherapy 3(3,0) Survey of alternative theories of psychological treatment for behavioral and emotional disorders. Various theoretical assumptions, techniques, and applications of each approach are examined and compared and case examples are considered. *Preq:* PSYCH 370 or consent of instructor.

H490 Senior Division Honors Research I 2-4(2-4,0) Preparation and defense of a research proposal. The proposed project should be empirical, historical, or theoretical in nature. *Preq:* Junior standing and consent of department head.

H491 Senior Division Honors Research II 2-4(2-4,0) Completion of the proposed research project resulting in a written thesis. *Preq:* PSYCH H490.

493 Practicum in Clinical Psychology 3(1,5) Students are given an opportunity to apply classroom theory in solving individual and community problems through interaction with community agencies and other professional groups in the mental health area. The student has limited but well-controlled contact with actual clinical problems as they occur in the community environment. *Preq:* Consent of instructor.

495 Practicum in Applied Psychology 3(1,5) Students are provided practical experience in the area of applied psychology. The student usually will be involved in a project designed to help solve an industrial problem through a direct application of industrial or social psychology. *Preq:* Either PSYCH 352 or 364 or 397 and consent of instructor.

497 Directed Studies in Psychology 2-4(2-4,0) Study of a particular topic under the direction of a faculty member. Specific program is to be organized by the student and faculty member and submitted to the department head for approval. May be repeated for a maximum of six credits. *Preq:* PSYCH 310 one additional 300-level psychology course, and consent of instructor.

499, 699 Seminar Topics in Current Psychology 3(3,0) A seminar in current topics in psychology. Topics will change from semester to semester and will be announced prior to each semester's registration. May be repeated once for credit, but only if a different topic is covered. *Preq:* PSYCH 201 and one 300-level course or consent of instructor.

810 Research Design and Quantitative Methods I 3(3,0)

811 Research Design and Quantitative Methods II 3(3,0)

822 Human Perception and Performance 3(3,0)

833 Cognitive Psychology 3(3,0)

860 Psychology of Training and Evaluation 3(3,0)

861 Personnel Psychology 3(3,0)

862 Organizational Development 3(3,0)

863 Work Motivation and Satisfaction 3(3,0)

891 Master's Research. Credit to be arranged.

895 Applied Psychology Internship 3-6(0,3-6)

RELIGION (REL)

Professors: L. J. Greenspoon, C. H. Lippy, *Acting Head;* *Visiting Assistant Professor:* N. A. Hardesty

101 Introduction to Religion 3(3,0) Variety of religious experience and expression in human life.

301 The Old Testament 3(3,0) Survey of books of the Old Testament with special consideration given to the development of the concepts, institutions, and theology of the ancient Hebrews.

302 A Survey of New Testament Literature 3(3,0) Study of the books of the New Testament from the standpoint of their occasion, content, literary form, and basic theology.

306 Judaism 3(3,0) Examination of the development of Judaism from Biblical to modern times.

307 The Christian Tradition 3(3,0) Examination of the development of Christianity in Western civilization from the post-New Testament period to the present, stressing institutional growth and changes, theological currents, and the interaction of Christianity with culture.

308 Religions of the Ancient World 3(3,0) Selected religious movements in ancient Mesopotamia, Egypt, Canaan, and the Greco-Roman world with emphasis on movements outside the Judeo-Christian tradition.

309 Oriental Philosophies and Religions 3(3,0) Study of the philosophical and religious teachings of Hinduism, Buddhism, Confucianism, and Taoism.

310 Religion in the United States 3(3,0) Development of religion in the United States from the Colonial period to the 20th century. Attention will be devoted to analyzing broad currents in religious movements and religious thought which have given shape to the American pluralistic experience.

401, 601 Studies in Biblical Literature and Religion 3(3,0) Critical examination of a selected topic in biblical studies. Topic will vary from year to year. May be repeated one time for credit. *Preq:* Consent of instructor.

402, 602 Studies in Religion 3(3,0) Thorough examination of a selected topic in one or more of the religious traditions of the world or of religious life in a particular region. The topic will vary from year to year. May be repeated one time for credit. *Preq:* Consent of instructor.

499 Independent Study 1-3(1-3,0) Study of selected problems, issues, or movements in religion under the direction of a faculty member chosen by the student. Student and faculty member develop a course of study designed for the individual student and approved by the head of the department prior to registration. *Preq:* Consent of instructor.

RURAL SOCIOLOGY (RS)*Professor: E. L. McLean*

301 Rural Sociology 3(3,0) Study of human social relationships as influenced by life in the open country and in small towns and villages including considerations of the rural population, rural social institutions, processes of change in agricultural technology, and community area planning and development.

303 (SOC) Methods of Social Research I 3(3,0) See SOC 303.

359, 659 (SOC) The Community 3(3,0) Examination of the sociological aspects of contemporary communities and of their growth and development. Structural relations of social class, status and power and the relationships among social institutions within the community are examined. Emphasis is placed on the organization and development of communities in a constantly changing environment.

371 (SOC) Population and Society 3(3,0) See SOC 371.

401, 601 (SOC) Human Ecology 3(3,0) Analysis of the interrelationships between the physical world, modifications in natural environments, human settlement patterns, and institutions that both encourage and regulate environmental modification. Emphasis will be given to human social organizations whereby natural resources are conserved, reduced in quality, or depleted. *Preq:* Consent of instructor

403, 603 (SOC) Methods of Social Research II 3(3,0) See SOC 403.

471, H471, 671 (SOC) Demography 3(3,0) Demographic concepts, theory, and research methods for vital statistics, migration, and population distribution and projections; collection and processing of demographic data, and organization of demographic data systems. *Preq:* RS (SOC) 359.

495 (SOC) Field Experience 3(1,8) See SOC 495.

498 (SOC) Independent Study 3(1,6) See SOC 498.

881 Rural Sociology Research 1-3(0,2-6)

RUSSIAN (RUSS)*Lecturer: J. Bridgwood*

101, H101 Elementary Russian 4(3,1) Training in pronunciation, grammatical forms, and syntax with a view of giving the student the fundamentals necessary to read simple Russian texts. Three hours a week classroom instruction and one hour a week in the language laboratory.

102, H102 Elementary Russian 4(3,1) Continuation of RUSS 101. *Preq:* RUSS 101

196 Practicum in Russian 1(0,1) On-campus program of teaching foreign languages to children. Students work under the supervision of faculty in planning and teaching one 45-minute class per week to children in grades 1-8. May be repeated for a total of 3 credits. *Preq:* Third year standing in language or consent of department head.

201, H201 Intermediate Russian 3(3,0) Brief review of RUSS 101 and 102, with conversation, composition, and dictation, and the beginning of more serious reading of Russian prose in short stories and plays. *Preq:* RUSS 102.

202, H202 Intermediate Russian 3(3,0) Conversation, composition, and dictation based on readings of more difficult Russian prose than in the earlier courses. *Preq:* RUSS 201.

205 Russian Conversation and Composition 3(3,0) Oral and written training in Russian. The course will include situational role play, conversation groups, oral presentations, video work, written compositions, and speeches. *Preq:* RUSS 201.

398 Directed Reading 1-3(1-3,0) Directed study of selected works in Russian. May be repeated for a total of six semester credits. *Preq:* RUSS 202 or equivalent and consent of department head.

SCIENCE AND TECHNOLOGY IN SOCIETY (STS)

300 Issues in Science, Technology and Society 3(3,0) Course will help students understand how technology and science operate within a total societal context by examining various issues that exist in society. Focus is placed on how we use those machines and principles and the results of that use.

SOCIOLOGY (SOC)

Professors: K. W. Crader, R. J. Knapp, R. F. Larson, *Head*; *Associate Professors:* L. G. Peppers, J. W. Ryan, C. M. Sieverdes, D. K. Sturkie III, B. J. Vander Mey, W. M. Wentworth, M. F. White; *Assistant Professor:* J. M. Coggeshall; *Visiting Assistant Professor:* J. P. Smith

201, H201 Introduction to Sociology 3(3,0) Sociological perspective: study of contemporary groups, organizations, and societies in terms of human social behavior, social change, social structure, and social institutions.

202 Social Problems 3(3,0) Social problems involving the family, education, health care, political and legal systems, economy, population, environment, community; and special problems associated with age, economic, racial, status, and gender inequality.

303, H303 (RS) Methods of Social Research I 3(3,0) Introduction to methods of social research: research design, sampling, measurement, reliability, and validity; the relationship between theory and research. Required of all Sociology majors. *Preq:* SOC 201.

310, H310 Marriage and Intimacy 3(3,0) Examination of mate selection, living together, marital relations, family planning, conflict resolution, divorce and remarriage, later life adjustments, and singlehood as a lifestyle in the United States. *Preq:* SOC 201 or consent of instructor.

311 The Family 3(3,0) Cross-cultural analysis of the family as a basic social institution; the history, structure, and functions of the family in various cultures; and effects of social change on the family. *Preq:* SOC 201.

330 Industrial Sociology 3(3,0) Development of industrial society; effects on culture, social institutions, and individuals; industry and community; cross-national comparison of management styles; and a comparative analysis of work in industrial and developing nations. *Preq:* SOC 201.

331 Urban Sociology 3(3,0) Urbanization as a social process and related conditions of work, family structure, social mobility, crime, lifestyle, technology, and development of urban areas in the Third World. *Preq:* SOC 201.

350 Self and Society 3(3,0) Social psychology from the sociological viewpoint. Examination of the interactional and group influences on such individual conditions as childhood and life-course development, language, emotions, motives, sexuality, deviance, and self-concept. *Preq:* SOC 201.

351 Collective Behavior 3(3,0) Spontaneous, transitory, and sporadic group behavior: crowds, panics, riots, fads, and social movements. *Preq:* SOC 201.

359, 659 (RS) The Community 3(3,0) See RS 359.

371 (RS) Population and Society 3(3,0) Social, economic, and political consequences of population structure and change, including problems of food and resources, as well as population goals and policies in developing countries and the United States. *Preq:* SOC 201.

380 Introduction to Social Services 3(3,0) Fundamentals of casework practice, including philosophy and values, models of group work and ethics in social services work. *Preq:* SOC 201.

382 Child Abuse and Treatment 3(3,0) Examination of the causes and consequences of child maltreatment and exploitation; forms of child maltreatment (physical, emotional, sexual abuse, child neglect, child labor); strategies and techniques of treatment; and child maltreatment and the judicial system. *Preq:* SOC 201.

390 The Criminal Justice System 3(3,0) Social systems analysis of criminal justice agencies; primary focus on law enforcement and corrections and their interagency relationship with courts and prosecution. (Not open to students who have taken SOC 490). *Preq:* SOC 201.

391 Sociology of Deviance 3(3,0) Patterns of deviant behavior: subcultures, careers, and lifestyles of deviants; deviance theory and research. *Preq:* SOC 201.

392 Juvenile Delinquency 3(3,0) The nature, extent, and causes of juvenile delinquency; societal attempts to control delinquent conduct and gang violence; emergence of the juvenile justice system. *Preq:* SOC 201.

393 Criminology 3(3,0) The nature, and causes of criminal behavior; societal attempts to control crime; social responses to crime, criminals, and the criminal justice system. *Preq:* SOC 201.

394 Sociology of Mental Illness 3(3,0) Mental illness as a social phenomenon, including cultural and social influences, organizational settings of mental health care delivery, legal issues, patient-therapist relationships, and mental illness intervention as social control. *Preq:* SOC 201.

395 Sociology of Alcohol and Drug Abuse 3(3,0) Social issues involved in alcohol and drug abuse, including the assessment of sociological theories of drug abuse, addiction, and prevention; societal problems associated with the misuse of alcohol, narcotics, and other drugs. *Preq:* SOC 201.

401, 601 (RS) Human Ecology 3(3,0) See RS 401.

403, 603 (RS) Methods of Social Research II 3(3,0) Advanced methods in social research; consideration of various techniques, methodological approaches, and research designs; laboratory experience in various phases of research. *Preq:* SOC 201, SOC (RS) 303 or consent of instructor.

404, 604 Sociological Theory 3(3,0) A survey of the development of sociological theory. Required of all Sociology majors. *Preq:* SOC 201.

H408 Honors Thesis Research I 3 Reading and research related to the senior honors thesis. Completion of junior honors requirements and approval of department head and thesis adviser required. *Preq:* SOC H303, H310, and honors status.

H409 Honors Thesis Research II 3 Research and writing related to the senior honors thesis. *Preq:* SOC H408 and honors status.

430, 630 Sociology of Organizations 3(3,0) The analysis of administrative organizations and voluntary associations; applied analysis of their formal and informal group relations, communications, and effectiveness. *Preq:* SOC 201.

432 Sociology of Religion 3(3,0) A sociological analysis of religious systems and movements and their influence on other social institutions. *Preq:* SOC 201.

433, 633 Developing Societies 3(3,0) Examination of the social and historical causes of development and underdevelopment. Various sociological theories of development are reviewed. Selected countries are examined in an international context. *Preq:* SOC 201.

440, 640 Leisure, the Mass Media, and Culture 3(3,0) Production and consumption of leisure activities in contemporary society; popular culture, and the mass media as dominant leisure forms; social effects of leisure activities; relationship between work and leisure. *Preq:* SOC 201.

441, 641 Sociology of Sport 3(3,0) Sport as a social phenomenon; emphasis on leadership, discrimination, socialization, communication, conflict, and cooperation in sport; emerging social issues in contemporary sports. *Preq:* SOC 201.

460, 660 Race, Ethnicity, and Class 3(3,0) Investigation of sociological perspectives on race, ethnic relations, and social stratification. Analysis of the impact of social class on minority movements. (Not open to students who have taken SOC 431.) *Preq:* SOC 201.

461 Sex Roles 3(3,0) Female and male socialization; changes in statuses, roles, inequality, and opportunities in contemporary society, with cross-cultural comparisons. *Preq:* SOC 201.

471, H471, 671 (RS) Demography 3(3,0) See RS 471.

480, 680 Medical Sociology 3(3,0) Sociocultural factors in the etiology and treatment of physical illness; medical occupations and professions; the organization of health-care delivery systems. *Preq:* SOC 201.

481, 681 Aging and Death 3(3,0) Sociological orientation to aging populations focusing on the impact of health care, welfare, and retirement systems. Includes dying as a social phenomenon, suicide, euthanasia, and funerals. (Not open to students who have taken SOC 383.) *Preq:* SOC 201.

495 (RS) Field Experience 3(1,8) Students participate in selected field placements under supervision for eight hours weekly and in a one-hour seminar per week. May be repeated once for credit. To be taken Pass/Fail only. *Preq:* SOC 380 or 390 and consent of department head.

498 (RS) Independent Study 3(1,6) Individual readings or projects in sociological areas not covered in other courses. A written proposal must be approved by the instructor directing the work and by the department head prior to registration. *Preq:* Consent of department head.

499 Seminar in Selected Topics in Contemporary Sociology 3(3,0) Sociological areas of current interest will be explored. May be repeated by special arrangement for a maximum of 6 credits. *Preq:* Consent of department head.

SPANISH (SPAN)

Professors: G. J. Fernandez, M. M. Sinka; *Associate Professors:* P. R. Heusinkveld, J. A. McNatt, L. T. Perry, S. E. Torres; *Assistant Professors:* B. G. Durham, S. C. King, R. F. Mixon, S. M. Saz, L. E. Seamon, J. M. Whitmire; *Visiting Instructors:* L. Gray, S. K. Harris; *Visiting Lecturer:* E. G. Fernandez

101, H101 Elementary Spanish 4(3,1) A course for beginners in which the essentials of grammar are taught and a foundation is provided for a conversational and reading knowledge of the language. Three hours a week of classroom instruction and one hour a week in the language laboratory.

102, H102 Elementary Spanish 4(3,1) Continuation of SPAN 101.

196 Practicum in Spanish 1(0,1) An on-campus program of teaching foreign languages to children. Students work under the supervision of faculty in planning and teaching one 45-minute class per week to children in grades 1-8. May be repeated for a total of 3 credits. *Preq:* Third year language standing or consent of department head.

198 Situational Spanish 4(3,2) Intensive course relating to a student's field of study. Designed primarily for non-Liberal Arts majors preparing for employment or study abroad. Subsequent placement into SPAN 201 by departmental examination. Only for elective credit in the College of Liberal Arts. Cannot be counted toward any Bachelor of Arts language requirements.

199 Situational Spanish 4(3,2) Continuation of SPAN 198. Subsequent placement into SPAN 201 by departmental examination. Only for elective credit in the College of Liberal Arts. Cannot be counted toward any Bachelor of Arts language requirements. *Preq:* SPAN 198 or consent of instructor.

201, H201 Intermediate Spanish 3(3,0) A brief review of SPAN 101 and 102, with conversation, composition, and dictation, and the beginning of more serious reading of Spanish prose in short stories and plays. *Preq:* SPAN 102.

202, H202 Intermediate Spanish 3(3,0) Introduction to Spanish literature: representative short stories, essays, novels, poetry, and plays. *Preq:* SPAN 201.

299 Foreign Language Drama Laboratory 1(0,3) Participation in foreign language drama productions. No formal class meetings, but an average of three hours per week in a foreign language drama workshop for production. May be repeated for a total of three semester credits. *Preq:* Consent of instructor directing the play.

301 Introduction to Hispanic Literary Forms 3(3,0) Introduction to the basic structures and elements of fiction, poetry, drama, and essay, including literary and critical theory, with readings in 19th and 20th century Spanish and Spanish-American literatures. *Preq:* SPAN 202.

303 Survey of Spanish Literature I 3(3,0) Literary movements, influences, and authors from the beginnings to the end of the seventeenth century. Representative works, discussions. *Preq:* SPAN 201, 202.

304 Survey of Spanish Literature II 3(3,0) Literary movements, influences, and authors from the eighteenth century to the present. *Preq:* SPAN 201, 202.

305 Intermediate Spanish Conversation and Composition I 3(3,0) Practice in spoken Spanish with emphasis on vocabulary, pronunciation, intonation, and comprehension. Written work to increase accuracy. Assignments in the language laboratory. *Preq:* SPAN 202 or consent of department head.

307 Spanish Civilization 3(3,0) Study of the significant aspects of the culture of Spain from its origins to the present. *Preq:* SPAN 202 or consent of department head.

308 Spanish-American Civilization 3(3,0) Study of the significant aspects of the culture of Spanish-American countries from the pre-Colonial period to the present. *Preq:* SPAN 202 or consent of department head.

311 Survey of Spanish-American Literature 3(3,0) Literary movements, influences, authors, and works from the Colonial period to the present. *Preq:* SPAN 202 or consent of department head.

316 Spanish for International Trade I 3(3,0) Spoken and written Spanish common to the Hispanic world of business and industry, with emphasis upon business practices and writing and translating business letters and professional reports. Cross-cultural references provide opportunity for comparative and contrastive analysis of American and Spanish cultural patterns in a business setting. *Preq or Coreq:* SPAN 202 and 305, or consent of department head.

- 398 Directed Reading 1-3(1-3,0)** Directed study of selected topics in Spanish literature, language, and culture. May be repeated for a maximum of six credits. *Preq:* Consent of department head.
- 401 Modern Spanish Literature 3(3,0)** The generation of 1898 to the Civil War: Readings from Unamuno, Azorin, Valle-Inclan, Antonio Machado, Ortega Y Gasset, Garcia Lorca, and Alejandro Casona. *Preq:* SPAN 303, 304, or 311.
- 402 Contemporary Spanish Literature 3(3,0)** Spanish literature from the Civil War reconstruction period to the present with emphasis on the contemporary novel and theatre. *Preq:* SPAN 303, 304, or 311.
- 409 Advanced Grammar and Composition 3(3,0)** Intensive study of syntax and stylistics through composition and translations. Practice in spoken Spanish. *Preq:* Senior standing or consent of department head.
- 411 Advanced Spanish Conversation and Composition 3(3,0)** Continuation of SPAN 305 with emphasis on greater fluency and sophistication in oral and written expression. *Preq:* SPAN 305 or consent of department head.
- 414 Practical Communication Skills 3(3,0)** Study of those communication skills (correspondence, composition, legal, medical, technical, and business terms) essential to effective communications with native Spanish speakers in these areas. *Preq:* SPAN 306, 316, or consent of department head.
- 416 Spanish for International Trade II 3(3,0)** Study of the language and cultural environment of the Spanish-speaking markets of the world, including the linguistic and cultural idioms which support global marketing in general and the international marketing of textiles, agricultural products, and tourism in particular. *Preq:* SPAN 316.
- 422 The Contemporary Spanish-American Novel 3(3,0)** New trends in the development of the Spanish-American novel from the 1940's to the present. *Preq:* SPAN 303, 304, or 311.
- 435 Contemporary Hispanic Culture 3(3,0)** Study of social, political, economic, and artistic manifestations of contemporary Hispanic culture. *Preq:* SPAN 307, 308, or consent of department head.
- 498 Independent Study 1-3(1-3,0-3)** Directed study of selected topics in Spanish language, literature, and culture. *Preq:* Consent of department head.
- 499, 699 Spanish Literature, Language, and Culture 3(3,0)** Selected topics and themes that have characterized Spanish literature, language, and culture throughout the centuries. May be repeated for a maximum of 6 credits. *Preq:* SPAN 303, 304, 311, or consent of department head.

SPEECH (SPCH)

Assistant Professor: D. S. Geddes; *Instructors:* L. D. Egan, R. W. Leeman; *Visiting Instructors:* P. M. Kellett, R. E. Roberts

- 162 Forensic Laboratory 1(0,3)** Research, preparation, and practice leading to participation in on-campus and intercollegiate debate and individual events competition. May be repeated for a maximum of 3 credits.
- 250 Public Speaking 3(3,0)** Practical instruction in public speaking; practice in the preparation, delivery, and criticism of short speeches.
- 260 Broadcasting Internship 1-3(0,2-6)** Part- or full-time supervised work experience with a television or radio network, station, or related industry such as an advertising agency handling broadcasting clients. To be taken Pass/Fail only. *Preq:* Consent of instructor.
- 268 Voice and Diction 3(3,0)** Practical work to improve vocal clarity and tonal quality of the student's speech. Corrects such voice and diction problems as improper enunciation and extreme dialects.
- 360 Persuasion 3(3,0)** Theories of persuasion and propaganda; practical instruction in the composition of persuasive speeches. *Preq:* Sophomore literature or consent of instructor.
- 361 Argumentation and Debate 3(3,0)** Basic principles of argumentation with emphasis on developing skills in argumentative speech. The role of the advocate in contemporary society and an analysis of selected significant debates in U.S. history. *Preq:* Sophomore literature or consent of instructor.
- 363 Oral Interpretation of Literature 3(3,0)** Analysis and oral interpretation of selected poetry and prose; training in development of effective tone production. *Preq:* Sophomore literature or consent of instructor.

364 Organizational Communication 3(3,0) Theories and techniques of communications within small groups and other organized bodies. *Preq:* Sophomore literature or consent of instructor.

365 Broadcasting: History and Criticism 3(3,0) A critical examination of the history and issues of broadcasting in America. *Preq:* Sophomore literature or consent of instructor.

366 Special Topics in Speech 3(3,0) Consideration of select major areas of study in speech. *Preq:* Sophomore literature or consent of instructor.

369 Modern American Political Rhetoric 3(3,0) Examination of American political rhetoric after 1900, focusing on such notable speakers as Franklin D. Roosevelt, John F. Kennedy, and Martin Luther King, Jr. *Preq:* Sophomore literature or consent of instructor.

TEXTILE CHEMISTRY (TC)

Professors: J. R. Aspland, H. M. Behery, M. J. Drews, B. C. Goswami, C. W. Jarvis, J. J. Porter, B. L. Rutledge II, E. A. Vaughn, *Director; Associate Professor:* C. D. Rogers; *Assistant Professors:* M. S. Ellison, O. F. Hunter, Sr., G. C. Lickfield; *Lecturer:* B. F. Rankin

303 Textile Chemistry 3(3,0) Study of the properties and reactions of aliphatic and aromatic organic compounds. Emphasis will be placed on mechanistic interpretations and the development of synthetic schemes leading to polyfunctional compounds of the types encountered in the textile industry. *Preq:* CH 102. *Coreq:* MTHSC 206.

304 Textile Chemistry 3(3,0) Fundamental principles of physical chemistry with emphasis on areas frequently encountered in the textile industry including thermodynamics, kinetics, and solution properties. These concepts will be applied to the study of organic compounds and organic reaction mechanisms. *Preq:* TC 303.

305 Textile Chemistry Laboratory 1(0,3) Introduction to the techniques used in the synthesis and characterization of organic compounds. *Coreq:* TC 303.

306 Textile Chemistry Laboratory 1(0,3) Techniques used in the measurement of the physico-chemical properties of polymers and textile chemicals. *Coreq:* TC 304.

315, 615 Introduction to Polymer Science and Engineering 3(3,0) Chemistry of monomers and polymers and the chemical and physical properties of polymers are discussed emphasizing fiber forming, synthetic polymers. Includes molecular characterization, structure, morphology, and mechanical properties as they relate to the design of polymer systems for end uses in textiles, geotextiles, plastics and fiber-reinforced composite materials. *Preq:* CH 201 and 330 or 224, TC 304, or consent of instructor.

316, 616 Chemical Preparation of Textiles 3(2,3) The chemicals used in the preparation of fabric for dyeing and finishing. Oxidizing and reducing agents and their control and effect on various fibers. Colloidal and surface active properties of various compounds and the fundamental factors influencing these properties.

317 Polymer and Fiber Laboratory 1(0,3) High molecular weight polymers are prepared from monomers and their chemical and physical properties are measured as functions of critical end use parameters using instrumental and physical methods. *Coreq:* TC 315.

405 Principles of Textile Printing 3(2,3) The development of modern textile printing systems will be studied. In addition, the colloidal requirements of colorants, thickener compositions, rheology of printing pastes, and the various physical requirements necessary for a successful printing system in a modern plant will be examined. *Preq:* TEXT 314 or consent of instructor.

406 Textile Finishing—Theory and Practice 3(2,3) Study of the application of chemicals to textile substrates and how they affect the substrate's physical and chemical properties. The course emphasizes the theories of chemical modification of textiles as well as the technology of finishing.

457, 657 Dyeing and Finishing I 3(3,0) Study of the different classes of dyestuffs and the chemistry of their applications to different fibers. The theories, principles and mechanisms for the dyeing of textile fibers and fabrics will be presented as well as the reaction mechanisms of various finishing agents applied to different substrates. *Preq:* TC 315.

458, 658 Dyeing and Finishing II 3(3,0) The kinetics and equilibria of dyeing processes. The use of conductivity, diffusion and other methods useful for measuring absorption of isotherms and dyeing rates and the general thermodynamic relationships applicable to dyeing operations. Fiber properties such as zeta potential, dye sites, relative amorphous area available will be included.

459, 659 Dyeing and Finishing Laboratory I 1(0,3) Course will introduce the student to common dyeing and printing methods and to some of the machinery necessary to carry out dyeing operations. *Coreq:* TC 457.

460 Dyeing and Finishing Laboratory II 1(0,3) Course will cover finishing in addition to dyeing operations and their instrumental control. *Coreq:* TC 458.

475, 675 Cellulose Chemistry 2(2,0) The organic chemistry of cellulose and its derivatives is developed from the basic principles of carbohydrate chemistry. Emphasis is placed on the substitution and degradation reactions which are of particular importance in textile applications. Fiber morphology is treated in relation to its effect on textile chemical processing. *Preq:* TC 315 or consent of instructor.

811 Polymer Science I 3(3,0)

812 Polymer Science II 3(3,0)

820 (CHE) Composite Polymeric Materials 3(3,0)

821 Chemistry of Natural Polymers 3(3,0)

831 The Physical Chemistry of Dyeing 3(3,0)

840 Analytical Methods in Textile and Polymer Science 3(3,0)

891 Master's Research. Credit to be arranged.

TEXTILE MANAGEMENT AND TEXTILE SCIENCE (TEXT)

Professors: J. R. Aspland, H. M. Behery, M. J. Drews, B. C. Goswami, C. W. Jarvis, J. J. Porter, B. L. Rutledge II, E. A. Vaughn, *Director; Associate Professor:* C. D. Rogers; *Assistant Professors:* M. S. Ellison, O. F. Hunter, Sr., G. C. Lickfield; *Lecturer:* B. F. Rankin

175 Introduction to Textile Manufacturing 3(3,0) Introduction to the broad fields of textile, fiber, and polymer science and engineering with emphasis on the scientific, technological, and business principles utilized in producing fibers, yarns, and fabrics; enhancing fabric functionality by dyeing, finishing and printing; and establishing end-use products.

176 Natural and Man-made Fibers 4(3,3) Concept of natural and synthetic polymers as the raw materials of the textile industry is introduced. A survey of the origin, characteristics, and processing properties of various natural fibers and fiber-forming synthetic polymers. Formation of textile fibers from polymeric materials will be presented with specific emphasis on the polymer science and engineering principles.

201 Yarn Structures and Formation 4(3,3) Study of the fiber processing systems required to transform various fibrous materials into yarn. The course involves the machine principles and theories, relationship of the fibers to the process and the resultant yarn structures, and subsequent analysis of the yarn structure to define quality and to determine suitable manufacturing practices. *Preq:* TEXT 175 and 176 or consent of instructor.

202 Fabric Structures, Design, and Analysis 4(3,3) Study of fabric formation techniques designed to explore the principles and theories of modern technology. Evaluation and analysis of weaving, knitting, and nonwoven fabrication of textile structures. *Preq:* TEXT 201 or consent of instructor.

203 Introduction to Computer Applications in Textiles 3(3,0) Introduction to the use of micro and minicomputers and mainframe terminal sharing in the textile industry. Topics will include computer applications in both processing and management using BASIC and FORTRAN.

301 Fiber Processing I 3(2,2) Study of fibrous materials and their relationship to the fiber processing systems. The objectives, theories, principles, and mechanisms of the machines used in the earlier stages of fiber processing. The course is directed primarily to the staple fiber processing systems. Mechanical and mathematical fundamentals are applied to the machines concerned.

302 Fiber Processing II 3(2,2) Continuation of TEXT 301 emphasizing the later stages of fiber processing for the ultimate yarn strand. *Preq:* TEXT 301.

308 Apparel 4(3,3) Introduction to apparel construction techniques and analysis of problems commonly encountered in the apparel industry. Evaluation of fabric design and properties. *Preq:* TEXT 202 or consent of instructor.

311 Fabric Development I 3(2,2) Study of the basic theory of the cam loom weaving machine. The principles of designs of the basic plain, twill, and sateen fabric, and other weaves such as the honeycomb, the mock leno, and the huckaback weave. Weave analysis and preparation of necessary drafts are included.

312 Fabric Development II 3(2,2) Study of the theory and operation of the dobby head, Knowles head, Staubli dobby, Jacquard head, and multicolor selection for the above looms. Weave design for compound fabrics using two or more systems of warp and filling threads for three-dimensional weaves, weave analysis, and preparation of drafts are covered. *Preq:* TEXT 311.

313 Fabric Formation 3(3,0) Examination of the theories involved in the assembly of fibers and yarns into fabrics. The application of design, analysis and production of woven, knitted and non-woven fabrics. A brief survey of the fabric producing machines. Limited to Textile Chemistry and non-Textile majors.

314 Chemical Processing of Textiles 4(3,2) Concept of current procedures in the chemical, mechanical and physical preparation, and in bleaching, dyeing, printing and finishing of fabrics are presented; colorimetric and spectrophotometric methods of color control and test methods for the evaluation of the effectiveness of the treatments are emphasized. Not open to Textile Chemistry or Textile Management Chemical option majors.

321, 621 Fiber Science 3(2,2) Fiber properties and the scientific evaluation of these properties. Dimensional, mechanical, optical, electrical, thermal, and moisture relationships are established and investigated.

322, 622 Properties of Textile Structures 3(2,2) Yarn and fabric properties, their scientific significance and analysis. Dimensional, structural, and mechanical interrelationships are established and evaluated.

324 Textile Statistics 3(3,0) Introduction to statistics with particular application to the textile industry. Measures of central value and variation, probability, the normal curve, tests of hypotheses, elementary correlation and regression. *Preq:* Junior Standing.

333 The Textile Arts 3(2,3) Survey of the development of the hand loom from prehistoric times to the present. Studio work in the elements of handwoven fabrics, their design, analysis and production of four-harness counterbalance and jack looms. *Preq:* Junior standing or consent of instructor.

403, 603 Fiber Processing III 3(2,2) Concepts of current fiber processing machines, techniques, practices, and their validity are investigated. Problems are assigned that require use of acquired knowledge, textile testing equipment, and processing machines. The relation of fibrous material properties and processing dynamics to the fiber assemblies produced is studied. *Preq:* TEXT 301, 302.

411, 611 Fabric Development III 3(2,2) Study of specifications and loom details for the production of fabrics woven to the customer's order, including multicolor layouts. Warp and filling preparation are covered as well as size formulations and their methods of application. Warping and dressing plans are developed for the warper and the slasher. *Preq:* TEXT 312.

414 Knitted Structures 3(3,0) Survey of knitted structures dealing with the principles and mechanisms involved. Various systems are covered with emphasis on fiber and yarn requirements and fabric properties.

416, 616 Nonwoven Structures 3(2,2) Nonwoven fabric structures, their manufacture, properties, and applications. Methods of nonwoven fabric formation, resultant material characteristics and end-use applications are examined. *Preq:* TEXT 301 or consent of professor.

420, 620 Advanced Computer Applications in Textiles 3(3,0) Advanced study of the use of computer as professional support devices for textile management, research, and manufacturing, decision making. *Preq:* CPSC 120 or consent of instructor.

426, 626 Instrumentation 3(3,0) The principles of industrial and process instrumentation and control as applied in the textile industry. Static and dynamic characteristics of measurement devices. Transducer principles and techniques of their application for measurement of physical properties such as pressure, temperature, flow, weight, etc. Principles of process controllers. Applications of computers in textile process control.

428 Textile Research 1-3 Investigation of a problem in textile, fiber, or polymer science under the direct supervision of a faculty member. After completing the research, the student prepares a formal written report which is presented orally. *Preq:* Senior standing or consent of instructor.

429 Textile Research 1-3 Continuation of TEXT 428.

440, 640 Color Science 3(2,3) Application of the science of color to industrial practice in textiles, plastics, paints, lighting, and ceramics. Laboratory work will be performed on modern instruments and computers.

450 Textiles in Sports and Recreation 3(3,0) This course provides a basic understanding of the various types of fabrics used in athletic and recreational activities. Methods and procedures for the evaluation of fabric performance and properties as well as criteria for the selection and care of textile materials used in sports and recreational activities are provided.

460, 660 Textile Processes 3(3,0) Survey of machinery and processes of textile manufacturing from fiber formation through fabric finishing. For students with a nontextile background.

470 Textile Costing and Inventory Control 3(3,0) Study of the principles of costing as they specifically apply to the manufacture of textiles. Allocation of cost of material, labor, and overhead; determining the unit cost of yarns, fabrics, and finishes. Inventory systems, storage, materials handling and profiles. *Preq:* TEXT 202 or consent of instructor.

471 Plant Layout and Processing Design 3(3,0) Survey of the essentials necessary for textile process implementation from the pilot plant concept to a functioning textile process facility. Consideration will be given to material flow requirements, power requirements, machinery layout, environmental controls, and facility design. *Preq:* TEXT 202.

472, 672 Textile International Trade 3(3,0) The course will analyze the current structure of the international textile trade including imports, exports, tariffs and trade requirements. Field experience with local firms will be used to enhance the student's understanding. *Preq:* Senior standing or consent of instructor.

475, 675 Textile Marketing 3(3,0) Examination of the activities involved in the distribution of textile products in today's market. Emphasis will be placed on the role of consumer research and the analysis of fashion in the design and promotion of textile products.

476, 676 Carpet Manufacturing 3(3,0) Study of the materials, manufacturing technologies, products, and practices associated with the carpet manufacturing sector of the textile industry. Raw materials, product design, formation and finishing systems, evaluation methods, distribution and end-use applications are examined. *Preq:* TEXT 201, 202, or consent of instructor.

701 Applied Science Technologies 3(2,4)

821 Fiber Physics I 3(3,0)

822 Fiber Physics II 3(3,0)

830 Textile Physics 3(3,0)

835 Textile Structures 3(3,0)

840 Advanced Color Science 3(2,3)

845 Geotextiles and Geomembranes in Engineering Structures 3(3,0)

846 Textile Structures II 3(3,0)

866 Fiber Formation 3(3,0)

870 Advances in Textile Manufacturing 3(3,0)

880 Selected Topics 3(3,0)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

THEATRE (THEA)

Professors: C. S. Egan, A. R. Nichols; *Associate Professors:* J. L. Hodgins, R. C. Sawyer; *Assistant Professor:* R. A. Evans, Jr.; *Visiting Assistant Professor:* M. S. Mielke

170 Theatre Appreciation 3(3,0) Examination of the theatre event approached through historical context, play reading, analysis of production practices, and field trips to live dramatic performances.

279 Theatre Laboratory 1(0,3) Practical work in theatre on a production designed for public presentation. May be repeated for a maximum of three credits. *Preq:* Sophomore standing.

375 Beginning Acting 3(2,3) Fundamentals of acting; basic stage techniques; exercises in interpretation, improvisation, characterization; experience in supervised performance. *Preq:* Sophomore literature or consent of instructor.

376 Principles of Stage Direction 3(2,3) Directing and staging techniques for the proscenium stage; exercises in composition, movement, picturization; experience in direction of scenes. *Preq:* Sophomore literature or consent of instructor.

377 Stagecraft 3(2,3) Theory and practice of stage design and technology. *Preq:* Sophomore literature or consent of instructor.

378 Historical Survey of the Theatre 3(3,0) Study of the changing roles of the playwright, director, actor, technician, and spectator in the Western theatre. *Preq:* Sophomore literature or consent of instructor.

398 Special Topics in Theatre 3(3,0) Select areas of study in theatre not addressed by other theatre course offerings. May be repeated once. *Preq:* Consent of instructor.

475 Intermediate Acting 3(2,3) Study and practice of acting styles and techniques, including those for period plays, musicals, and nonproscenium contemporary forms. *Preq:* THEA 375 or consent of instructor.

476 Advanced Stage Direction 3(2,3) Study of production practices, problems, and techniques of style and composition, including those for period plays, musicals, and plays presented in nonproscenium staging areas. *Preq:* THEA 376 or consent of instructor.

477 Stage Design 3(2,3) Study and practice in stage design, including drafting, graphics, drawing, rendering, scene painting, and light plotting. *Preq:* THEA 377 or consent of instructor.

UNIVERSITY (UNIV)

101 University 1(3,0) Extended orientation to college with emphasis on making the transition from high school. May be taken during the first two semesters at Clemson only.

VOCATIONAL AND TECHNICAL EDUCATION (VTED)

810 Foundations of Vocational/Technical Education 3(3,0)

812 Vocational and Technical Program Finance 3(3,0)

833 Curriculum Construction in Vocational/Technical Education 3(3,0)

835 Applications of Instructional Technology 3(3,0)

850 Programs, Concepts, and Issues in Vocational and Technical Education 3(3,0)

861 Administration and Supervision in Vocational/Technical Education 3(3,0)

863 Inservice and Continuing Education 3(3,0)

876 College Teaching 3(3,0)

882 Seminar 1(1,0)

893 Advanced Research Design and Analysis 3(3,0)

980 Internship in Vocational-Technical Education 1-6(0,3-18)

991 Doctoral Research. Credit to be arranged.

WILDLIFE AND FISHERIES BIOLOGY (WFB)

Professors: A. G. Eversole, T. T. Fendley, D. L. Robinette, *Head*; J. R. Sweeney, G. W. Wood; *Associate Professors:* J. W. Foltz, T. E. Schwedler, J. R. Tomasso, Jr.; *Assistant Professor:* G. K. Yarrow

101 Introduction to Aquaculture, Fisheries and Wildlife 1(1,0) Informative sketch of aquaculture, fisheries science, and wildlife management. Students are introduced to principles, resources, professional organizations, and careers in these fields. *Preq:* Major in Wildlife and Fisheries Biology or consent of instructor.

306 Conservation of Wildlife in the Southeastern United States 2(2,0)F Study of the wildlife and fisheries resources of the Southeastern U.S. including population trends, life histories, and economic importance. Conservation, proper utilization, and protection of endangered species are emphasized. *Preq:* Junior standing or consent of instructor.

307 Hunting and Wildlife Management 1(1,0) Hunting techniques used to harvest renewable wildlife resources are examined with respect to their roles in sound management practices. The effects of selected hunting regulations on wild populations, safety, and ethics are discussed. *Preq:* Junior standing or consent of instructor.

350 Principles of Fish and Wildlife Biology 3(3,0) Introduction to principles of fisheries and wildlife biology on which sound management practices are based. Interrelationships of vertebrate and invertebrate biology, habitat, and population dynamics will be covered. *Preq:* One year of general biology.

412, H412, 612 Wildlife Management 3(2,3) Basic principles and general practices of wildlife management and conservation will be covered. Major problems concerning the management of wildlife resources, with emphasis on upland game species. Laboratory work includes practical work on the Clemson University woodlands and field trips to several areas where wildlife management is being practiced.

416, 616 Fishery Biology 3(2,3) Principles underlying freshwater fish production. Introduction to major groups of freshwater fishes and their habitats. Topics include identification, age and growth, fecundity, food habits, populations estimation, environmental evaluation, management practices, and fish culture. *Preq:* One year of introductory biology and Junior standing.

450, 650 Aquaculture 3(3,0) Basic aquacultural techniques applied to freshwater and marine organisms; past and present culture of finfishes and shellfishes around the world; principles underlying fish production; water quality, feeding, and nutrition as they influence production of cultured aquatic organisms. *Preq:* One year of general biology and Junior standing.

452, 652 Fish Physiology 4(3,3) Course will acquaint fisheries biologists and aquaculturists with the physiology of fish. Nutrition, bioenergetics, reproduction, and water and ion balance as they relate to fish culture and fisheries management will be emphasized. *Preq:* One year of general biology, one year of general chemistry, and ANPH 301 or consent of instructor.

460, 660 Warmwater Fish Diseases 2(2,0) Study of diseases in warmwater fishes including infectious and noninfectious processes. *Preq:* One year of general biology, Junior standing and consent of instructor.

462, H462, 662 Wetland Wildlife Biology 3(3,0) Study of wetland wildlife habitats, emphasizing classification by physical, chemical, and biological characteristics; the importance of wetland habitat for management and production of wetland wildlife species. *Preq:* BIOL 103/105 and 104/106; or 110/111.

463 Directed Research in Aquaculture, Fisheries and Wildlife Biology 1(0,3) Research problems in selected areas of aquacultural, fisheries, or wildlife science to introduce the student to experimental design, research techniques, and presentation of research results. May be repeated for a maximum of 3 credit hours. *Preq:* Junior standing and consent of instructor.

469, H469, 669 (ENT) Aquatic Insects 3(1,6) See ENT 469.

490 Field Training in Aquaculture, Fisheries, and Wildlife 6(0,18) The student, in an eight-to-ten week program, has the opportunity to observe aquaculture, fisheries, or wildlife management. Student will have supervised management responsibility. Total of 270 hours required. Must be prearranged at least two months in advance. To be taken pass-fail only. *Preq:* Senior standing in Fisheries and Wildlife Biology and consent of instructor.

493 Special Topics in Aquaculture, Fisheries and Wildlife 1-4(1-4,0) Specialized topics which explore current areas of research and management in either aquaculture, fisheries science, or wildlife management are examined in a lecture/seminar format. May be repeated for credit. *Preq:* Junior standing and consent of instructor.

499 Wildlife Biology and Fisheries Seminar 1(1,0) An exploration of current literature and research in fisheries and wildlife sciences. Students will participate in the analysis of research findings, utilizing skills acquired in their undergraduate programs. May be repeated once for credit.

809 Seminar in Wildlife and Fisheries Science 1(1,0)

815 Principles of Wildlife Biology 3(2,3)

816 Applied Wildlife Biology 3(2,3)

818 Waterfowl Ecology and Management 3(2,3)

819 Special Topics in Wildlife Management 1-4(1-4,0)

840 Fish and Shellfish Management 3(2,3)

860 Diagnostic Fish Disease 2(1,2)

861 Special Topics in Fishery Biology 1-4(1-4,0)

863 Special Problems in Wildlife and Fisheries Biology 1-3(0,3-9)

891 Master's Research. Credit to be arranged.

WOMEN'S STUDIES (WS)

301 Introduction to Women's Studies: Women's Lives 3(3,0) This interdisciplinary course explores the unique features of women's lives from childhood to old age. Course content is based on new research in many disciplines, including psychology, sociology, history, literature and the arts. *Preq:* Sophomore literature or consent of instructor.

498 Women's Studies Research and Theory 3(3,0) Focuses on the theoretical foundations for women's studies. Course readings will include essays on interdisciplinary approaches to women's studies, feminist theory, and feminist methodology. Required of Women's Studies minors. *Preq:* WS 301 or consent of instructor.

ZOOLOGY (ZOOL)

Professors: S. A. Gauthreaux, Jr., R. L. Hays, C. W. Helms, G. P. Noblet, E. B. Pivorun, E. E. Rupert, J. E. Schindler, A. P. Wheeler, J. B. Wourms; *Associate Professors:* J. M. Colacino, D. G. Heckel, R. R. Montanucci, D. G. Yardley; *Assistant Professor:* D. W. Tonkyn

100 The Biology of Human Survival 1(1,0) A biological overview of aspects of contemporary life of interest to the individual and to the social welfare of man now and in the future.

222 Human Anatomy 4(3,3) A basic and systematic study of human anatomy. *Preq:* BIOL 104 or 111 or equivalent.

223 Human Physiology 4(3,3) A basic and systematic study of human physiology. *Preq:* BIOL 104 or 111 and CH 102 or 112 or consent of instructor. BIOCH 210 and ZOOL 222 recommended.

301, H301 Comparative Vertebrate Anatomy 4(3,3) A comparative and phylogenetic study of the gross morphology of vertebrates. *Preq:* BIOL 104/106 or 111.

350, H350 Developmental Biology 4(3,3) Events and mechanisms responsible for the development of multicellular animals. Gametogenesis, fertilization, embryonic development, cellular differentiation, morphogenesis, larval forms and metamorphosis, asexual reproduction, regeneration, malignancy, and aging will be analyzed in terms of fundamental concepts and control processes. *Preq:* BIOCH 301 or consent of instructor.

403, H403, 603 Protozoology 3(3,0) A survey of the protozoa with emphasis on organization and function. Representative types of both free-living and parasitic forms will be examined for each major taxon. *Preq:* BIOL 104 and 106 or 111.

404, 604 Protozoology Laboratory 1(0,3) Laboratory exercises will reinforce the material presented in ZOOL 403 and will introduce students to techniques used in collection, preservation, and examination of protozoans. *Coreq:* ZOOL 403.

405, H405, 605 Animal Histology 4(3,3) A structural and functional study of the basic tissues of animals and the tissue makeup of organs. Mammalian histology is stressed but comparative histology will be incorporated. The course is directed toward study at the light microscope level. Detailed study of selected cells will utilize electron micrographs. *Preq:* BIOSC 202 or consent of instructor.

409, 609 Modern Biological Instrumentation 3(2,3) Introduction to the theory of operation and practical use of a variety of laboratory instruments of interest to the life scientist, including computer-based control and data-logging equipment. Includes a review of elementary electronics. The laboratory will emphasize actual instrument operation and the construction of simple electronic circuits. Not open to Engineering majors. *Preq:* Physics and an elementary knowledge of BASIC or FORTRAN.

410, H410, 610 Limnology 4(3,3) A detailed introduction to the physical, chemical, and biological interrelationships that characterize inland water environments. A fundamental approach to the

interactions of components of the environment is developed at the theoretical level. Field and laboratory instruction in techniques of analysis are utilized to illustrate applications of theoretical concepts. *Preq:* BIOSC 202, General Chemistry.

415, 615 Introduction to Mathematical Ecology 3(3,0) This course will focus on current and broadly applicable mathematical models in ecology emphasizing ecological assumptions underlying mathematical approaches, theories, and limitations of specific models, and the ecological insights provided. *Preq:* BIOSC 202, MTHSC 108, or consent of instructor.

421, 621 Seminar in Invertebrate Zoology 4(3,3) The course will consider advanced topics in invertebrate zoology. Content will vary in successive years and students may enroll more than once for credit with consent of instructor. Laboratory includes benchwork, several field trips to the South Carolina coast, and one to the Florida Keys over spring break.

430, 630 Introduction to Population Genetics 3(3,0) Study of the genetic structure of populations and its importance in evolution as shown by field, experimental, and theoretical studies. Topics include natural selection, migration, genetic drift, mutation, meiotic drive, linkage, mating systems, IQ and heritability, evolution of pesticide resistance, human population genetics, eugenics, and genetic counseling. *Preq:* BIOL 111, GEN 302.

450, H450, 650 Comparative Vertebrate Embryology 4(3,3) A comparative study of the developing vertebrate body from fertilization through organogenesis. Patterns of reproduction and embryonic development, morphogenesis, organogenesis, and the functional differentiation of cells and tissues will be considered. *Preq:* ZOOL 350 or consent of instructor.

456, 656 Medical and Veterinary Parasitology 4(3,3) Introduction to parasitism in the animal kingdom with emphasis on both basic and applied principles as they relate to economically and medically important diseases. Classical and experimental approaches to the study of parasitism are examined in reference to protozoa, helminths, and arthropods. *Preq:* BIOL 104, 106, or 111.

457, H457, 657 Comparative Physiology 4(3,3) A comparative study of physiological processes throughout the animal kingdom. Laboratories will introduce the use of basic instrumentation and will provide an opportunity to perform original experiments. *Preq:* BIOCH 301 or consent of instructor.

459, H459, 659 Systems Physiology 4(3,3) Physiological systems (neural, muscular, skeletal, endocrine, circulatory, respiratory, digestive, and excretory) of vertebrates and their homeostatic controls. *Preq:* BIOSC 202 or consent of instructor.

462, 662 Herpetology 3(2,3) Systematics, life history, distribution, ecology, and current literature of amphibians and reptiles. Laboratory study of morphology and identification of world families, and U.S. genera, as well as all southeastern species. Field trips will be required. *Preq:* BIOSC 202 or consent of instructor.

463, 663 Ichthyology 3(2,3) Systematics, life history, distribution, ecology, and current literature of fish. Laboratory study of morphology and identification of U.S. genera, as well as all southeastern species. Field trips will be required. *Preq:* BIOSC 202 or consent of instructor.

464, 664 Mammalogy 3(2,3) Origin, evolution, distribution, structure, and function of mammals, with laboratory emphasis on the mammals of South Carolina. Field Collection required. *Preq:* BIOSC 202 or consent of instructor.

465, 665 Ornithology 4(3,3) The biology of birds: their origin and diversification, adaptations, phylogeny, classification, structure and function, behavior, ecology, and biogeography. Field identification is emphasized and field trips are required. *Preq:* BIOSC 202 or consent of instructor.

470, 670 Animal Behavior 3(3,0) Historical and modern developments in animal behavior emphasizing the evolutionary and ecological determinants of behavior. A synthesis of ethology and comparative psychology. *Preq:* BIOSC 202 or consent of instructor.

471, 671 Animal Behavior Laboratory 1(0,3) Laboratory exercises that explore the behavior of animals. Emphasis is on behavioral observation and analysis and presentation of findings in a report format. *Preq:* BIOSC 202, ZOOL 470, or consent of instructor.

475, 675 Vertebrate Endocrinology 3(3,0) Introduction to the basic principles of neuroendocrine integration and homeostatic maintenance in vertebrates. Comparative morphology and physiology of various endocrine tissues and hormone chemistry and modes of action are considered. *Preq:* BIOSC 202, organic chemistry, or consent of instructor.

476, 676 Experimental Vertebrate Endocrinology Laboratory 2(0,6) Laboratory to demonstrate principles discussed in ZOOL 475. Experiments conducted by individuals will be drawn from classical papers which demonstrate specific endocrine functions; original experiments will examine hormonal effects on selected physiological parameters, and assays and determinations of unknown hormones will be made. *Preq:* ZOOL 475 or consent of instructor.

480, 680 Analysis of Development 3(3,0) Concepts, problems, and experimental observations central to the study of cellular differentiation and development, particularly in animals. Emphasis is on the critical reading of research literature on the control of genetic expression and nucleocytoplasmic, cell-cell, and cell-environmental interactions. *Preq:* ZOOL 350 or consent of instructor.

491 Special Problems in Zoology 2-4 Library and laboratory experience in experimental design and research in selected biological discipline. Results will be presented in an open seminar and in a research paper to be evaluated by at least two faculty members. May be taken for credit no more than twice for a maximum of 8 credits. *Preq:* Junior or Senior standing and consent of instructor.

493 Undergraduate Seminar 1(1,0) Exploration of current zoological literature. *Preq:* Senior standing.

701 Man's Impact on Ecology 3(3,0)

803 Population Dynamics 4(2,6)

810 Behavioral Ecology 3(3,0)

812 Seminar 1(1,0)

815 Physiological Ecology 4(3,3)

816 Advanced Ecosystem Analysis I 4(3,3)

817 Advanced Ecosystem Analysis II 4(3,3)

818 Community Ecology 4(3,3)

835 Interpretative Electron Microscopy 3(3,0)

852 Principles and Methods of Systematic Zoology 2(2,0)

861 Special Topics 1-4(1-4,0)

863 Special Problems 1-4

865 Advanced Ornithology 3(3,0)

881 Methods in Developmental Biology 2(0,6)

883 Special Topics in Evolutionary Biology 1-4(1-3,0-3)

884 Special Topics in Physiology 1-4(1-3,0-3)

885 Special Topics in Ecology 1-4(1-3,0-3)

886 Special Topics in Animal Behavior 1-4(1-3,0-3)

887 Special Topics in Cellular and Developmental Biology 1-4(1-3,0-3)

888 Special Topics in Organismal Biology 1-4(1-3,0-3)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

Index

- Academic Administration, 7
 Academic Advising, 45
 Academic Renewal, 43
 Accounting, 88, 169
 Accreditation, 11
 Administrative Officers, 7
 Administrative Organization, 11
 Admissions, 13
 Advanced Placement Examinations, 16, 41
 Aerospace Studies, 171
 Agricultural Economics, 172
 Agricultural Economics and Rural Sociology, 55
 Agricultural Education, 57, 174
 Agricultural Engineering, 58, 120, 175
 Agricultural Industries, 55
 Agricultural Mechanization, 177
 Agricultural Mechanization and Business, 61
 Agricultural Sciences, College of, 8, 54
 Agriculture, 178
 Agronomy, 62, 179
 Alumni Association, 27
 American Studies, 140, 181
 Animal Industries, 65
 Animal Physiology, 181
 Animal Science, 65, 181
 Anthropology, 183
 Application, Admission, 14
 Aquaculture, Fisheries, and Wildlife Biology, 72
 Architectural Studies, 183
 Architecture, 82, 185
 Architecture, College of, 8, 81
 Art and Architectural History, 185
 Astronomy, 192
 Auditing, 21, 44
- Bachelor of Arts Curriculum, 134
 Bequest, Clemson, 29
 Biochemistry, 152, 193
 Bioengineering, 194
 Biological Science, 195
 Biological Sciences, 114, 148, 153
 Biology, 197
 Board and Room Rates, 21
 Botany, 198
 Building Science, 187
 Building Science and Management, 85
 Buildings and Grounds, 30
- Calendar, 4
 Career Services, 36
 Ceramic Arts, 199
 Ceramic Engineering, 121, 199
 Chemical Engineering, 122, 201
 Chemistry, 149, 154, 204
 City and Regional Planning, 83
 Civil Engineering, 123, 206
 Class Attendance, 44
 Classification of Students, 42
 Clemson/Furman, 209
 Clemson, Thomas Green, 29
 Coaching Education, 210
 College of Education, 211
 Commerce and Industry, College of, 8, 88
 Communications, 141
 Community and Rural Development, 56, 211
 Comparative Literature, 212
 Computer Engineering, 124
 Computer Information Systems, 155
 Computer Science, 156, 212
 Computing Facilities, 32
 Continuing Enrollment Policy, 42
 Cooperative Education, 36
- Counseling Services, 35
 Course Descriptions, 169
 Course Prerequisites, 44
 Courses, Repeating, 41
 Credit by Examination, 16, 41
 Credit Limitation, 46
 Credit Load, 42
 Credit System, 39
 Credit, Transfer of, 16, 42
 Criminal Justice, 140
 Curricula, 49
- Dairy Science, 68, 216
 Deans, 8
 Dean's List, 45
 Degrees Offered, 49
 Design, 81
 Dormitories, 32
 Double Major, 51, 134
 Dropping Classwork, 40
- Early Childhood Education, 102
 Earth Science, 114
 Economics, 89, 217
 Education, 220
 Education, College of, 8, 101
 Education for Industry, 111
 Electrical and Computer Engineering, 225
 Electrical Engineering, 125
 Elementary Education, 102
 Engineering, 231
 Engineering Analysis, 119
 Engineering, College of, 9, 117
 Engineering Graphics, 232
 Engineering Mechanics, 232
 English, 105, 136, 233
 Entomology, 73, 238
 Entrance Examinations, 15
 Entrance Requirements, 13
 Environmental Science, 240
 Environmental Systems Engineering, 241
 Executive Officers, 7
 Expenses, 19
 Experimental Statistics, 242
- Final Examinations, 40
 Finance, 243
 Financial Aid, 35
 Financial Management, 92
 Fine Arts, 84
 Fishery Science (See Wildlife Biology)
 Food Science, 74, 244
 Food Service, 32
 Food Technology, 245
 Foreign Students, Admission, 18
 Forest Management, 129
 Forest Products, 130
 Forest and Recreation Resources, College of, 9, 129
 Forestry, 245
 Foundation, 26
 French, 249
 Freshman Orientation, 17
- General Education Requirements, 52
 Genetics, 251
 Geography, 251
 Geology, 149, 157, 252
 German, 254
 Grade-Point Ratio, 42
 Grade Protests, 41
 Grade Reports, 40
 Grading System, 39
 Graduate School, 7
 Graduate Studies, 255
 Graduate Study, 19
 Graduation Requirements, 46
 Graphic Communications, 109, 255

- Handicapped Students, 34
- Health, 256
- Health Center, Redfern, 33
- Health Insurance, 35
- Health Service, 33
- History, 105, 137, 257
- History of the University, 28
- Honor Graduates, 45
- Honors and Awards, 45
- Horticulture, 75, 260
- Hospital and Health Services Administration, 263
- Housing, 32
- Humanities, 263
- Incomplete Work, 39, 46
- Industrial Technology Education, 109
- Industrial Education, 111, 263
- Industrial Engineering, 127, 267
- Industrial Management, 93
- Information, General, 11
- Integrated Pest Management, 270
- Interdisciplinary Studies, 188
- International Programs, 37
- International Studies, 270
- Italian, 270
- Japanese, 270
- Journalism, 137
- Landscape Architecture, 86, 190
- Language and International Trade, 137, 271
- Latin, 271
- Law, 271
- Leisure Skills, 271
- Liberal Arts, 272
- Liberal Arts, College of, 9, 134
- Libraries, 7, 31
- Linguistics, 137
- Location of University, 29
- Management, 94, 272
- Management Science, 275
- Marine Science (See Wildlife Biology)
- Marketing, 95, 276
- Materials Engineering, 277
- Mathematical Sciences, 106, 115, 150, 158, 278
- Mechanical Engineering, 127, 283
- Medical Questionnaire, 34
- Medical Technology, 161, 287
- Microbiology, 162, 287
- Military Science, 289
- Minors, 51
- Modern Languages, 107, 138
- Music, 289
- Nursing, 146, 291
- Nursing, College of, 9, 145
- Nutrition, 294
- Operations Research, 159
- Packaging Science, 77, 295
- Parks, Recreation, and Tourism Management, 131, 296
- Pass/Fail Option, 40
- Philosophy, 139, 299
- Physical Sciences, 116
- Physics, 151, 164, 300
- Placement Service, 36
- Planning Studies, 189
- Plant Pathology, 79, 303
- Plant Physiology, 304
- Political Science, 108, 139, 304
- Post-baccalaureate, 18
- Poultry Business Studies, 71
- Poultry Science, 70, 307
- Premedicine and Pre dentistry (See Preprofessional Health Studies)
- Prepharmacy, 167
- Prephysical Therapy, 167
- Preprofessional Health Studies, 166
- Preprofessional Health, 50
- President, University, 6, 11
- Preveterinary Medicine, 80
- Psychology, 139, 309
- Readmission of Students, 19
- Refund of Fees, 21
- Religion, 312
- Research, University, 7
- Reserve Officers' Training Corps, 28
- Residence, Graduation Requirements, 46
- Residence, Rules Governing Fees, 23
- Returned Checks, 20
- Rural Sociology, 313
- Russian, 313
- Schedule of Charges, 21
- Scholarships (See Financial Aid)
- Scholastic Aptitude Test, 15
- Scholastic Regulations, 39
- Science Teaching, 113
- Science and Technology in Society, 313
- Sciences, College of, 9, 147
- Second Baccalaureate Degree, 51
- Secondary Education, 104
- Social Sciences, 109
- Social Services, 140
- Sociology, 140, 314
- Spanish, 316
- Spanish-American Area Studies, 143
- Special Student, 14
- Speech, 143, 322
- Textile Chemistry, 96, 318
- Textile Management, 96
- Textile Science, 96
- Textile Management and Textile Science, 319
- Theatre, 143, 321
- Transcripts, 23
- Trustees, University, 6
- Tuition, 21
- Undergraduate Studies, 7
- University, 322
- Veterans, Educational Benefits, 26
- Visual Arts, 190
- Vocational-Technical Education, 113
- Vocational and Technical Education, 322
- Wildlife and Fisheries Biology, 322
- Withdrawals from Courses, 39
- Withdrawal from the University, 44
- Women's Studies, 324
- Writing, 144
- Zoology, 324

GENERAL INFORMATION

SCHOLASTIC REGULATIONS

Agricultural Sciences

Architecture

Commerce and Industry

Education

Engineering

Information Resources

Nursing

Sciences

COURSE DESCRIPTIONS



CLEMSON UNIVERSITY
Office of Admissions and Registration
Clemson, South Carolina 29634

Special Fourth-Class Book
Return postage not guaranteed